



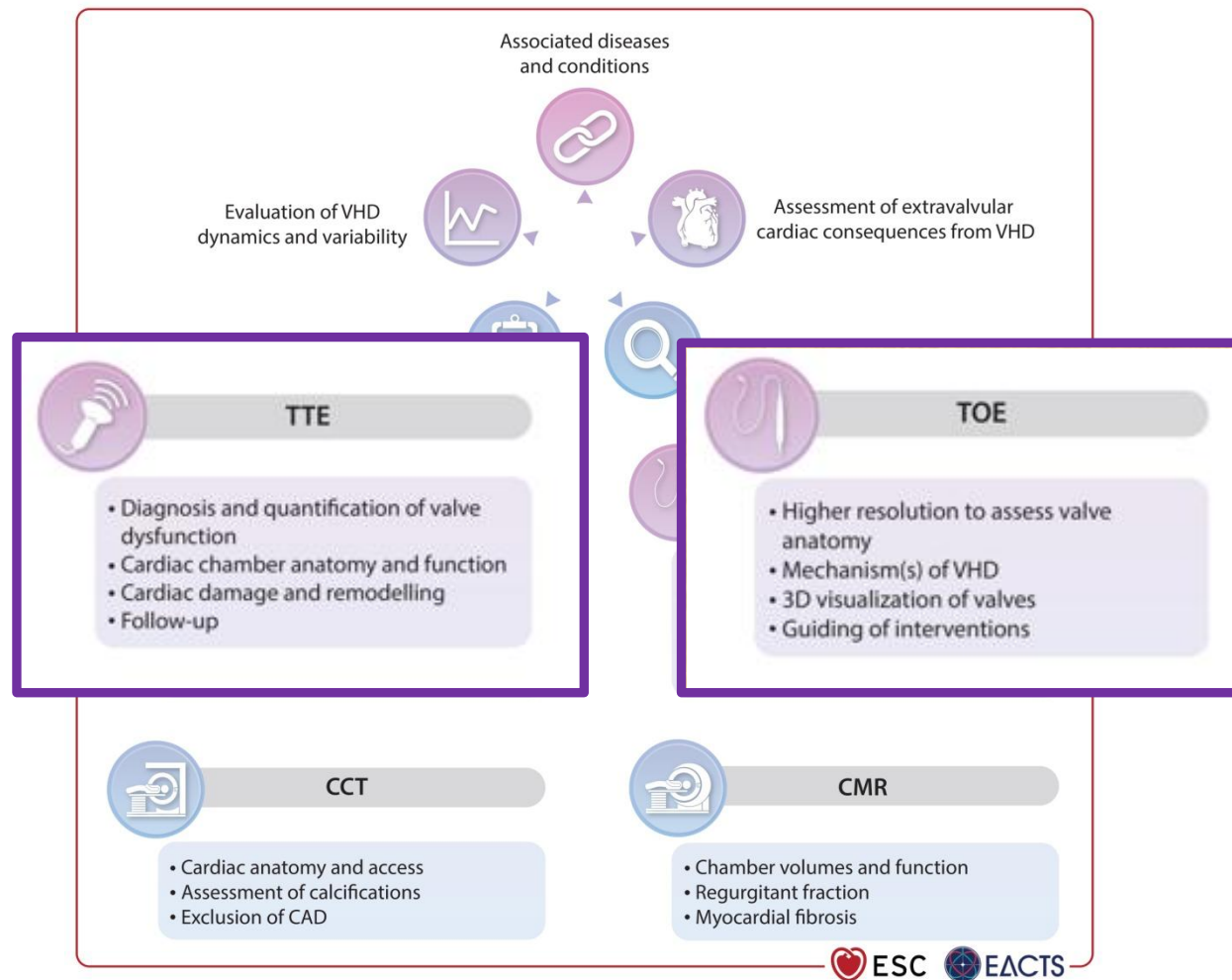
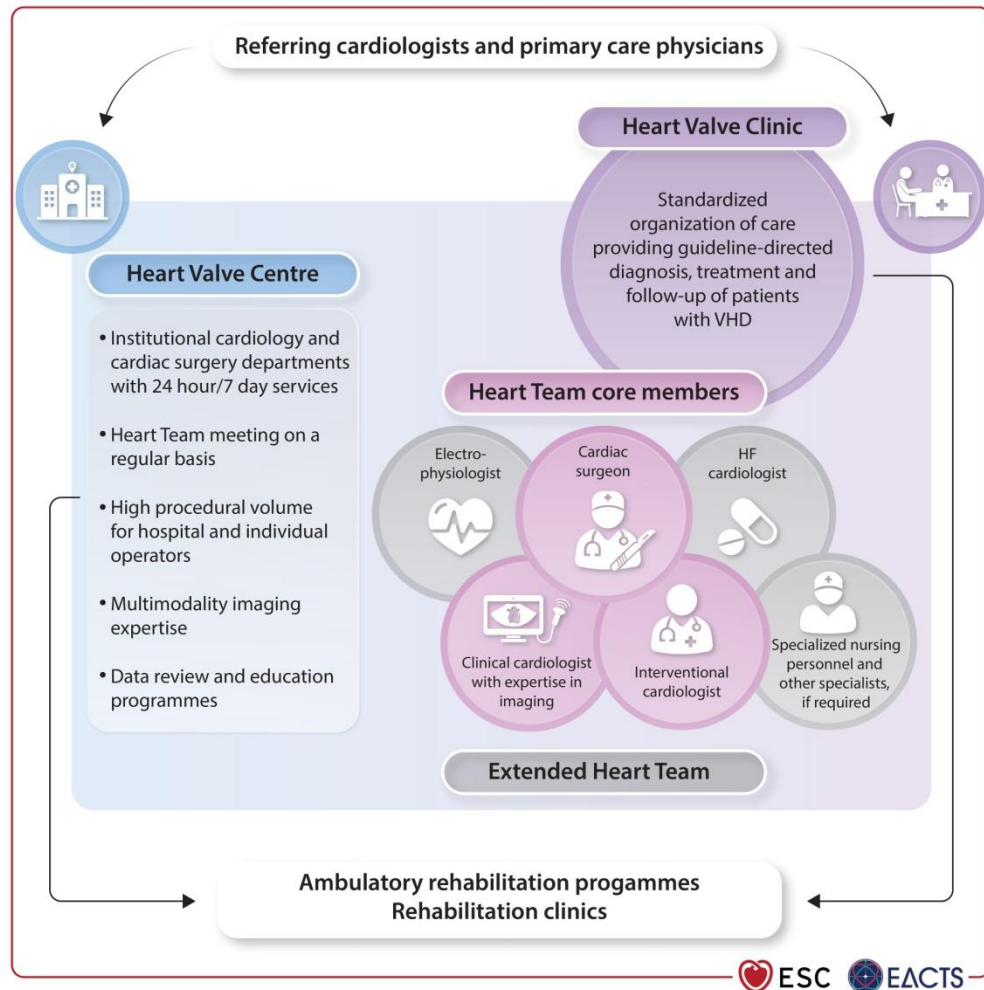
Onemocnění mitrální a trikuspidální chlopně ve světle nových doporučení ESC 2025

Hana Línková

Kardiologická klinika FN Motol

9. sjezd České asociace ambulantních kardiologů , Olomouc 2026

Integrativní vyšetření pacientů s chlopenními vadami



Etiologie

Mitrální regurgitace

Abnormita cípů, závěsného aparátu ?

Primární/ degenerativní
MF

Abnormita LK/ LS ?

Sekundární/ funkční
MR



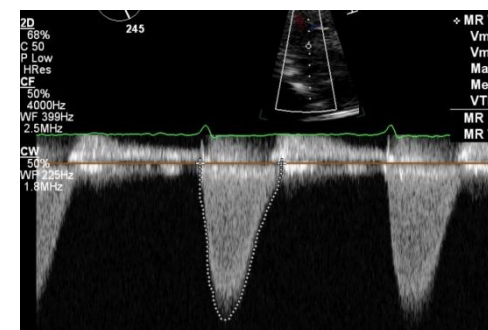
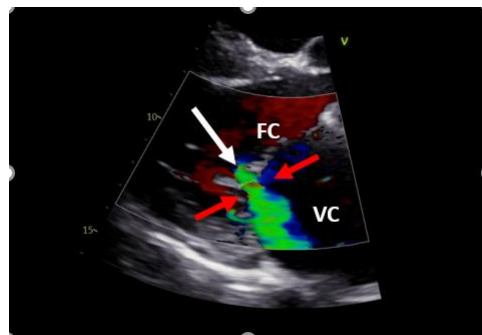
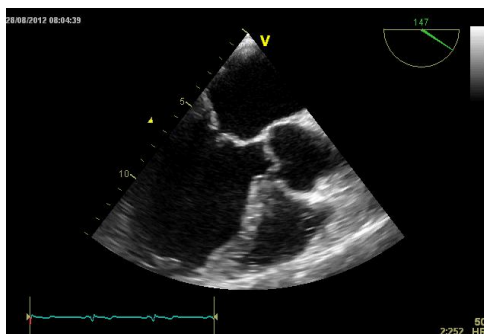
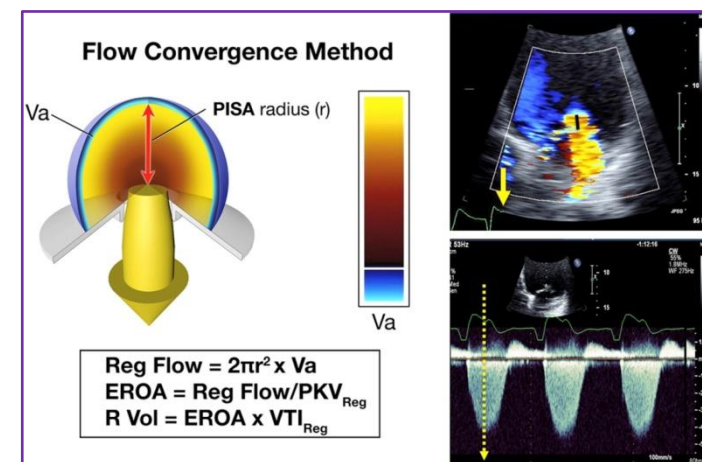
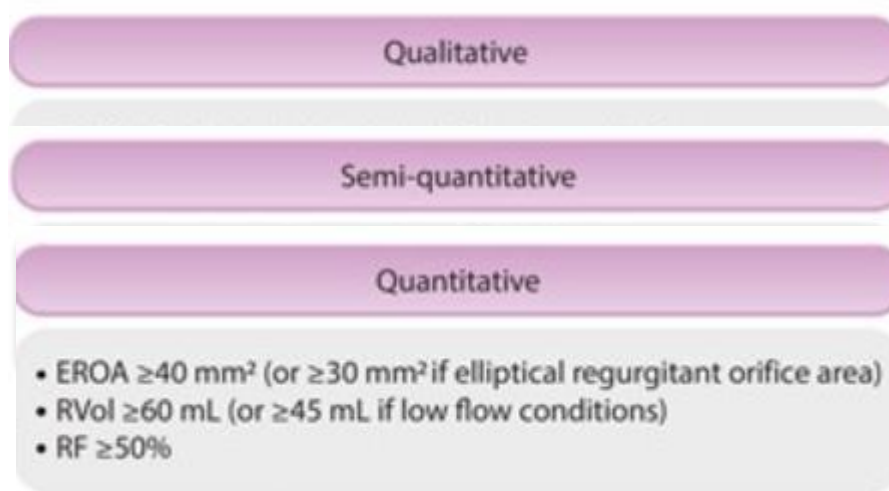
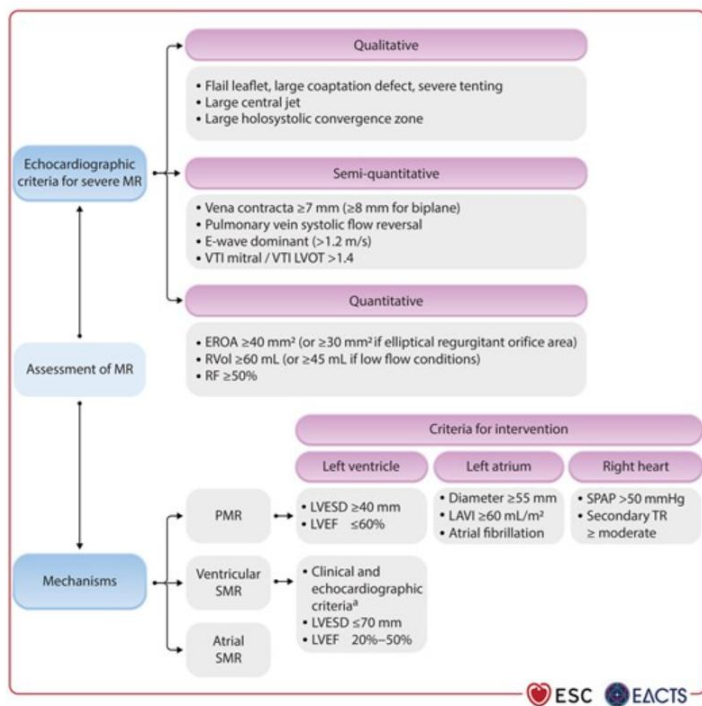
Carpentier typ II



Carpentier typ I a III



Kritéria významné mitrální regurgitace - 2D echokardiografie



3D – vena contracta area

Stopová MR
0-1

Mírná MR
1+

Mírná- střední
2+

Střední –významná
3+

Významná
4+



EROA -VCA (cm²) < 0,2

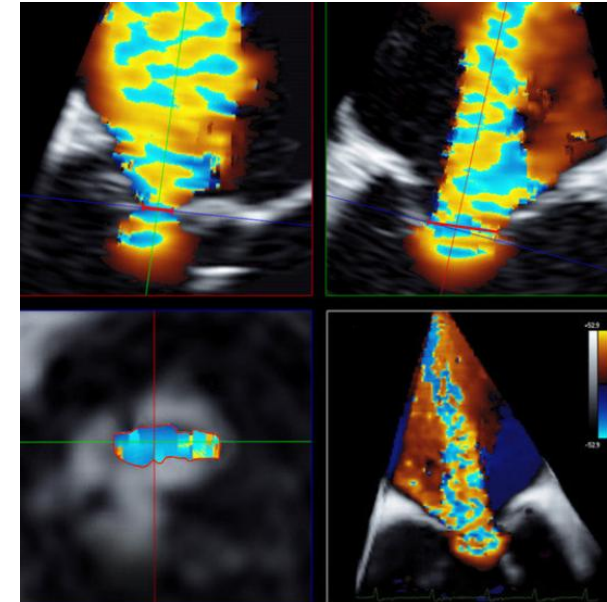
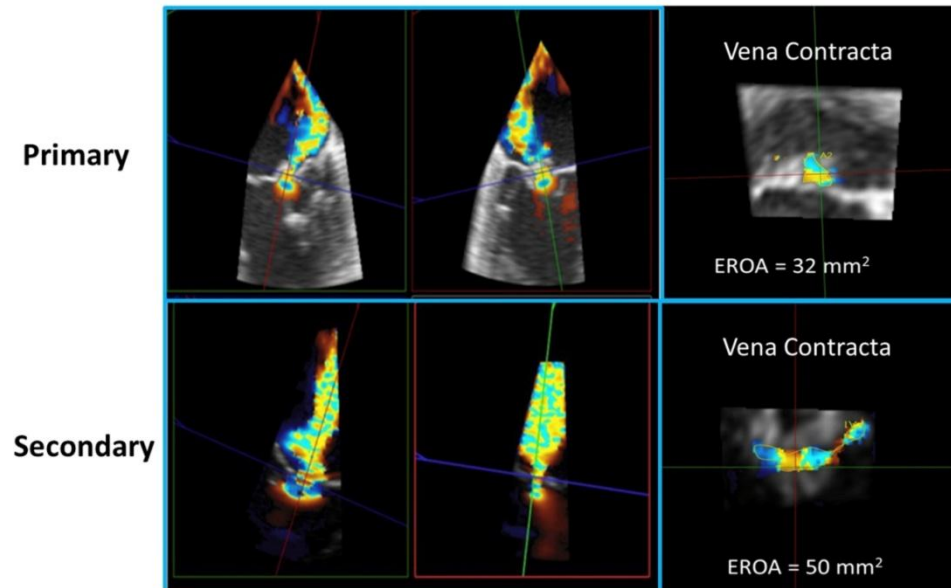
EROA -VCA (cm²) : 0,2

EROA -VCA (cm²) : 0,2- 0,29

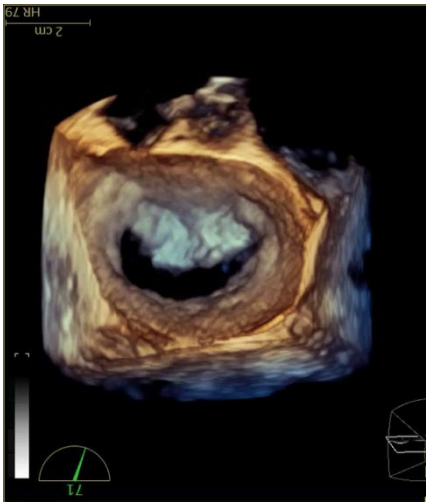
EROA -VCA (cm²) : 0,3-0.39

EROA -VCA (cm²) ≥ 0,40

3D Quantitation in Primary and Secondary MR



Morfologie mitrální chlopně 3D echo



sekundární MR



patologie na zadním cípu

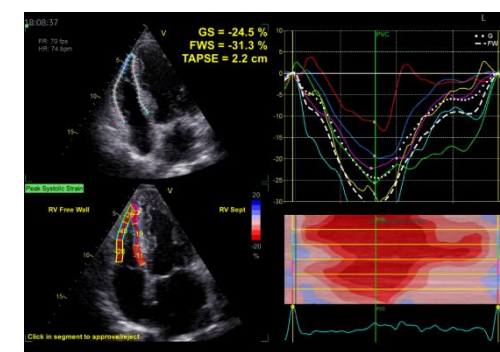
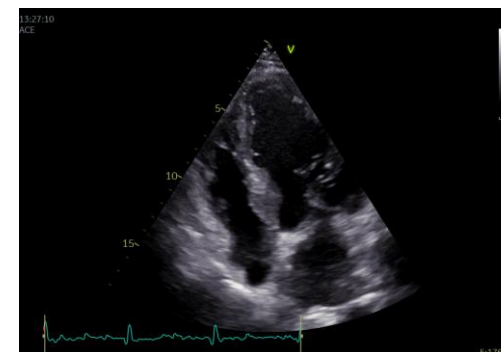
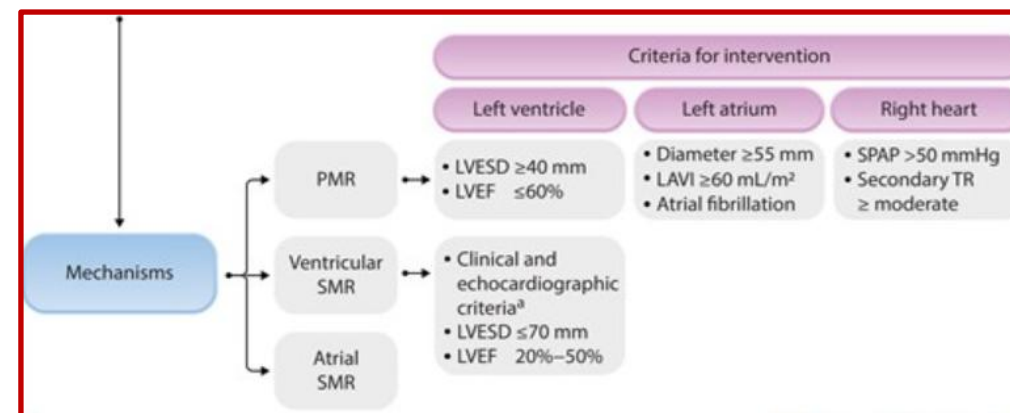
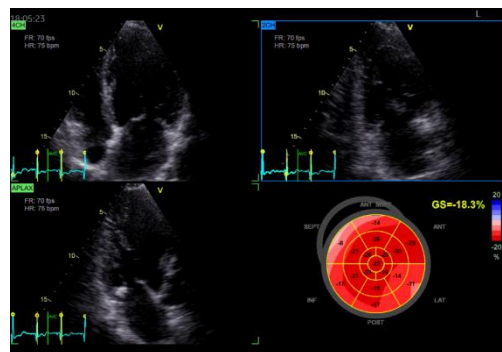
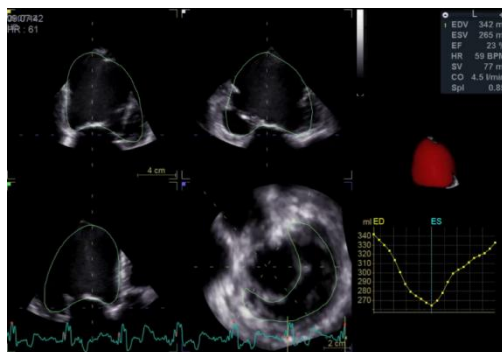
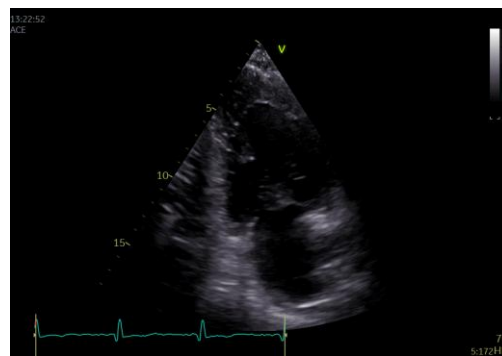
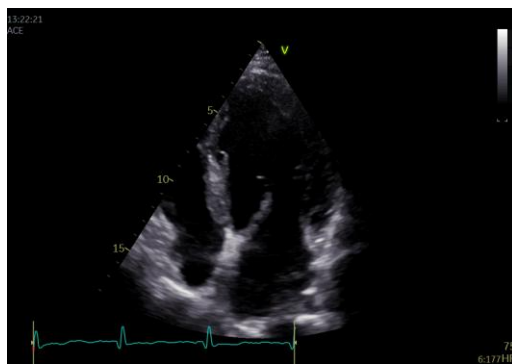


patologie na předním cípu



patologie na předním cípu
PM komisura

Zhodnocení základních echo parametrů



Rozměry LK – EDS, ESS , funkce levé komory EF Simpson, 3D, GLS levé komory , levá síň, hodnocení LAVI

Pravá komora rozměry
TAPSE , s TDI ,strain PK , FAC, přítomnost PH

Primární mitrální regurgitace

Primární MR

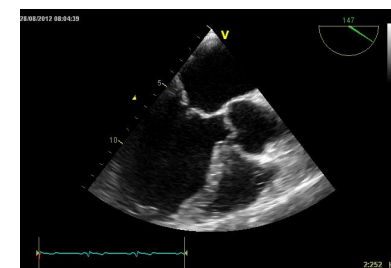
Akutní PMR

Endokarditis
Ruptura závěsného aparátu
Komplikace AIM



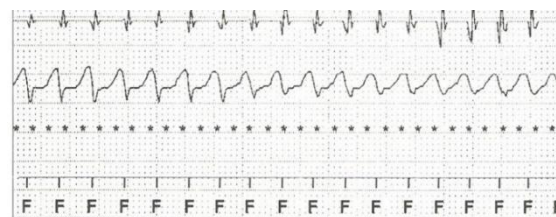
Chronická PM

Fibroelastická degenerace
M. Barlow
Revmatická
Kalcifikovaná Mi chlopeň

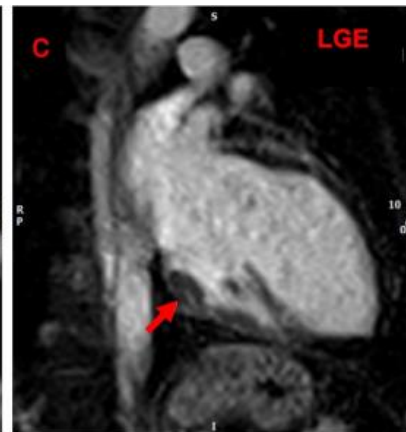
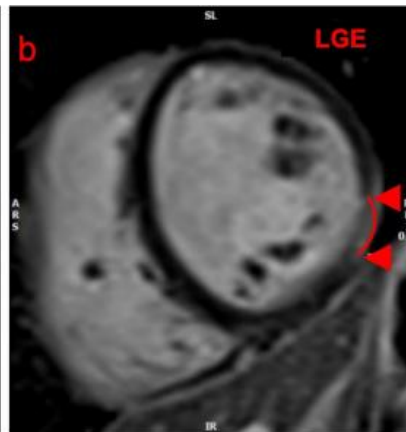
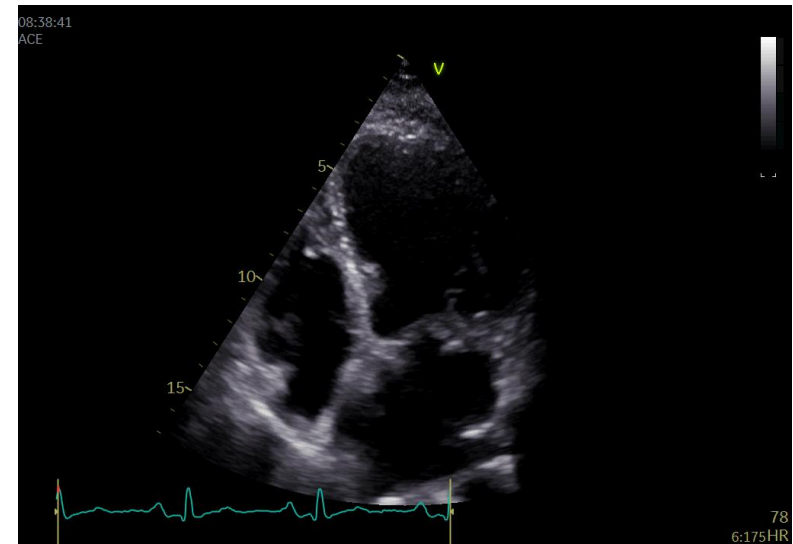
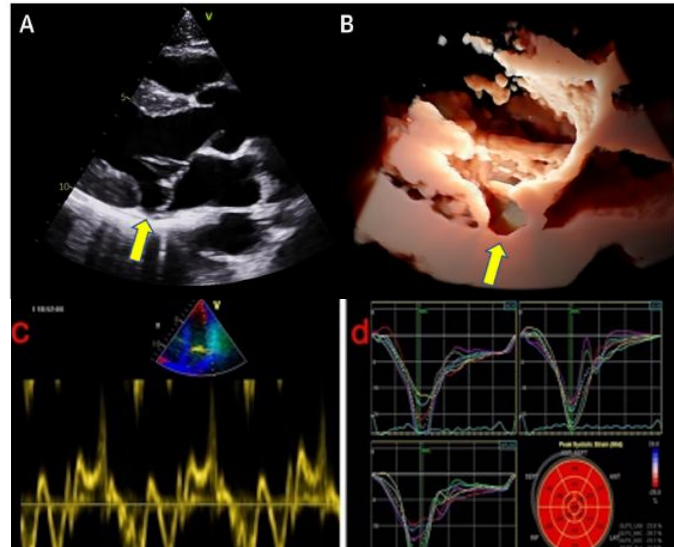
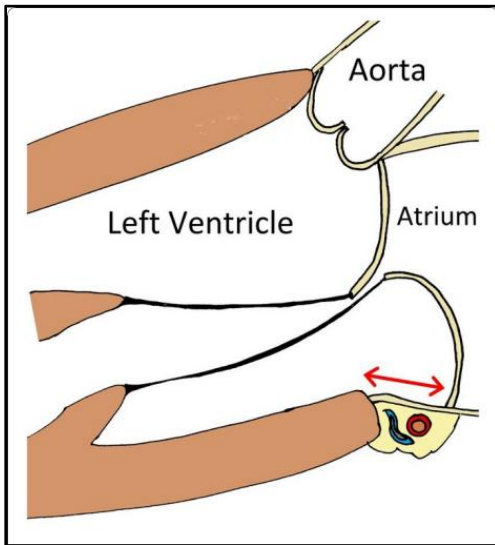


Prognostický význam

Srdeční selhání
Arytmie:
Fibrilace síní
Komorové arytmie
Náhlá smrt



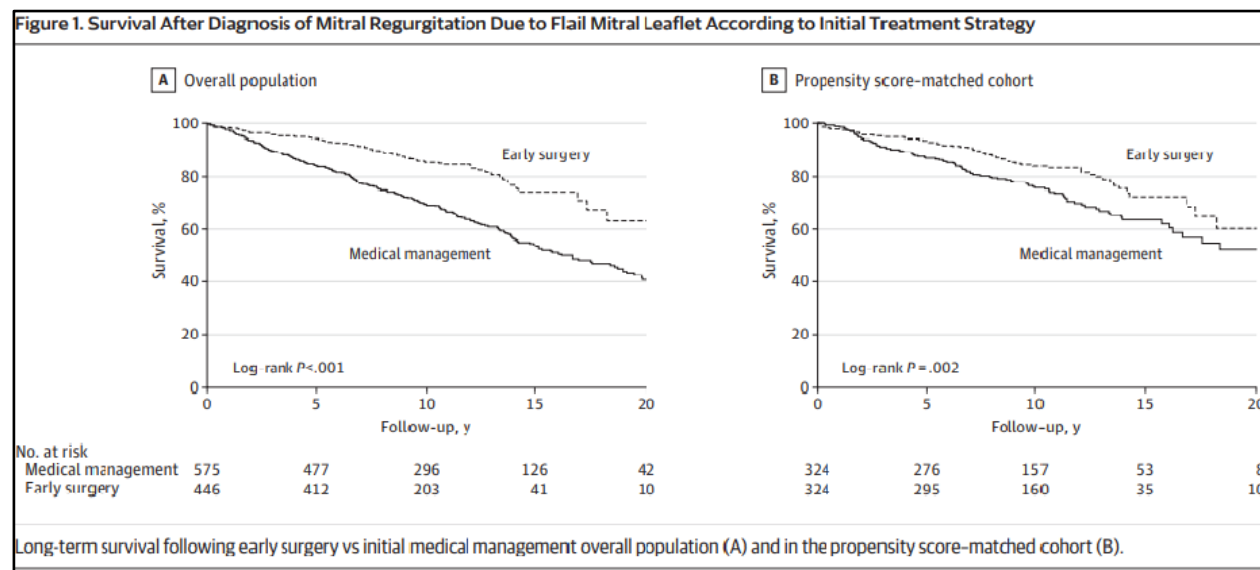
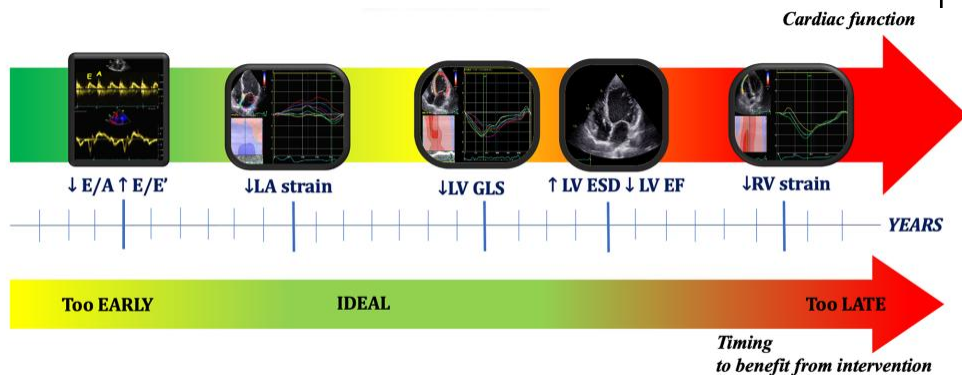
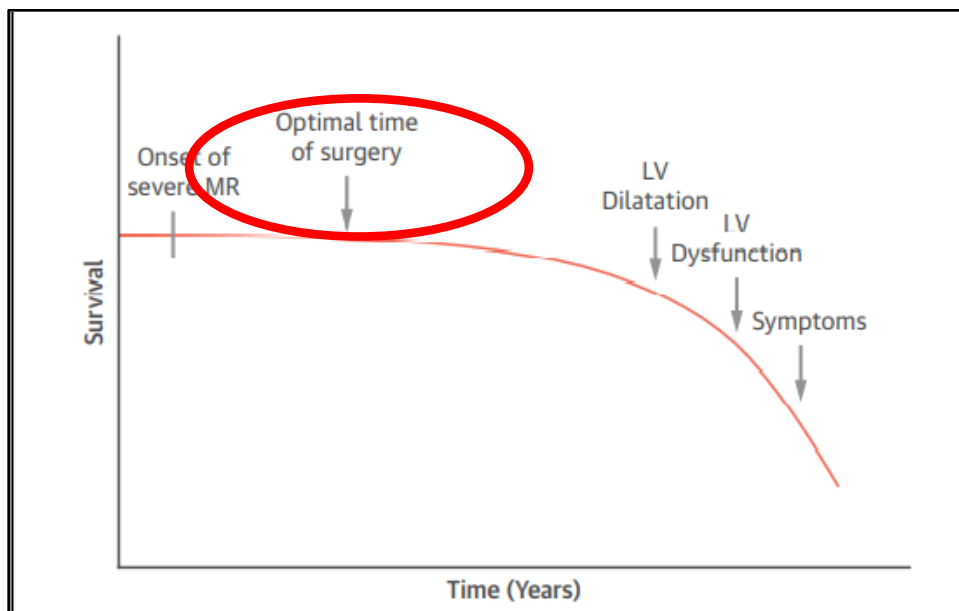
PMR- MAD



Maligní MVP syndrom

- bileaflet myxomatózní prolaps
- častěji ženy
- negativní nebo bifázické T na spodní stěně
- fibróza papilárního svalu nebo baze spodní stěny (MRI) a
- komplexní arytmie morfologie RBBB

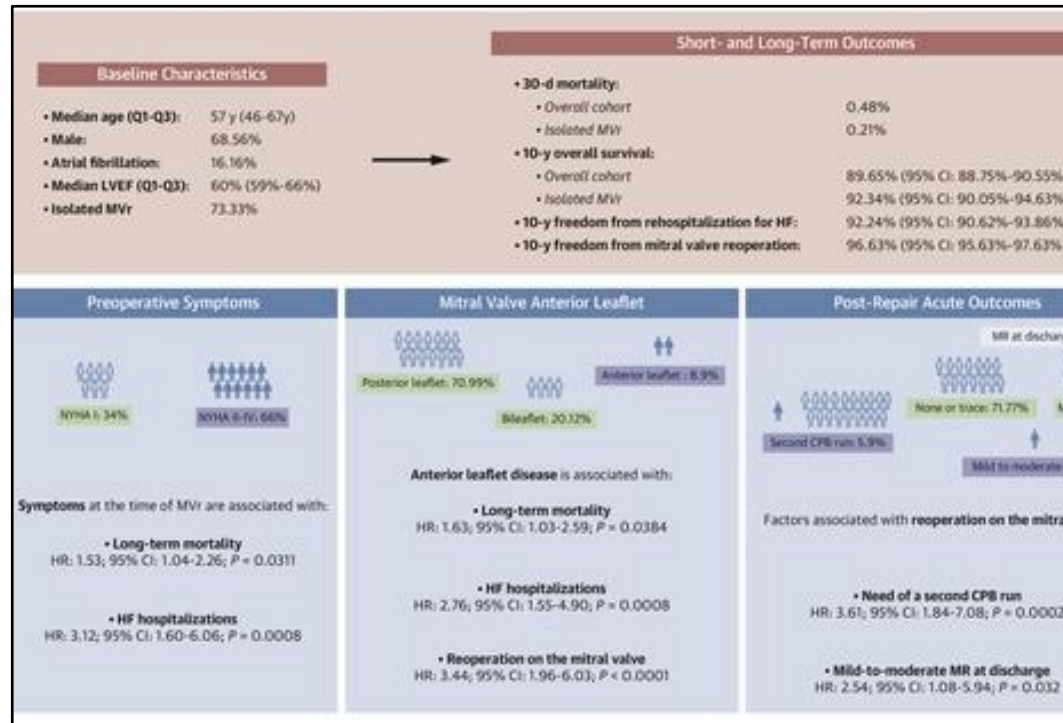
Primární mitrální regurgitace- kdy indikovat v operaci ?



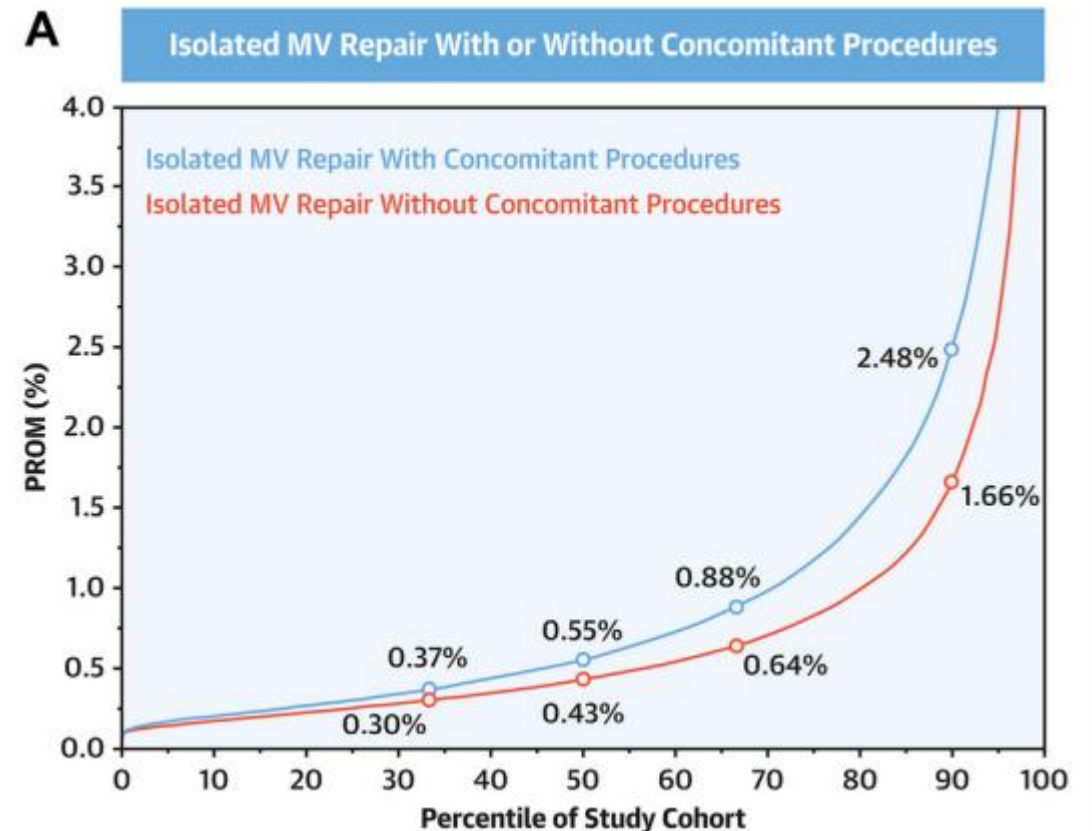
Převzato a upraveno dle O'Gara, JACC 2020
M.C. Pastore Heart Failure Reviews (2022) 27:1247–1260

PMR – strategie léčby

Long-Term Outcomes of Contemporary Surgical Repair for Degenerative Mitral Regurgitation

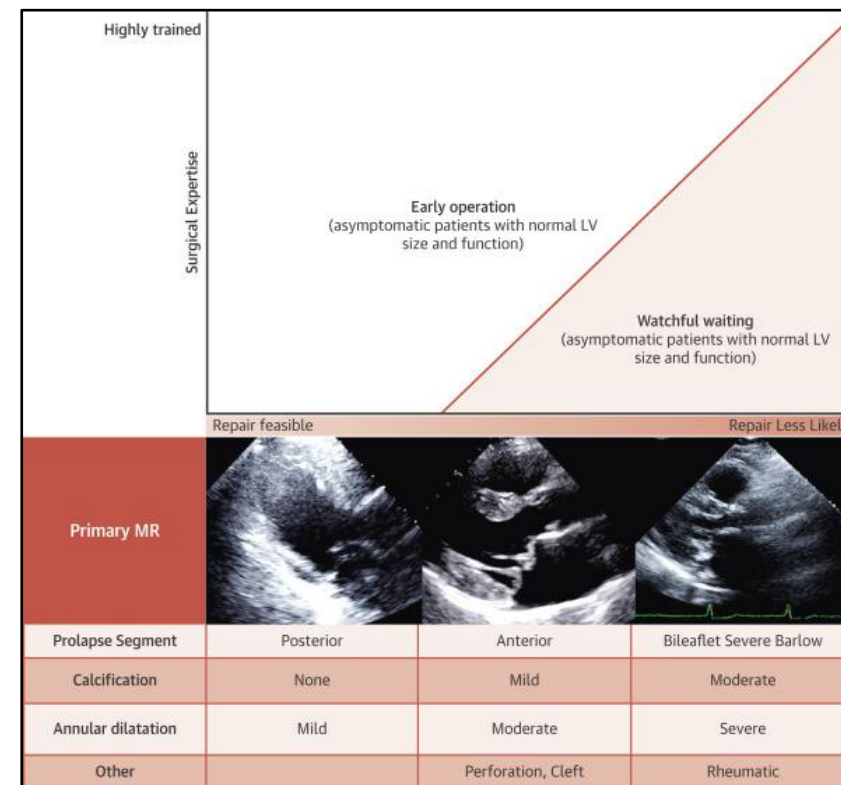
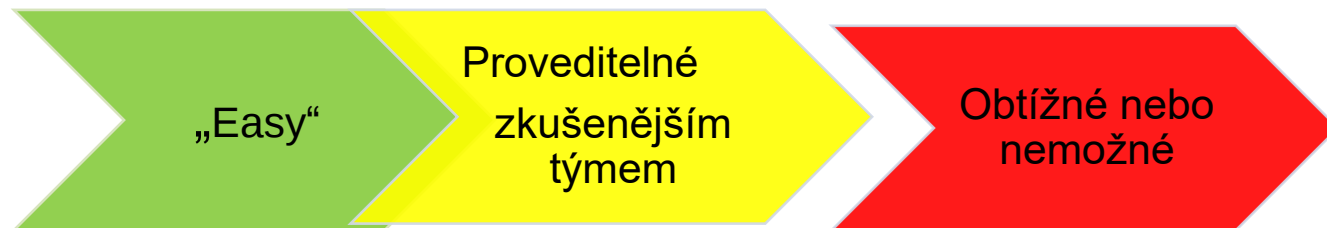


Risk of Surgical Mitral Valve Repair for Primary Mitral Regurgitation

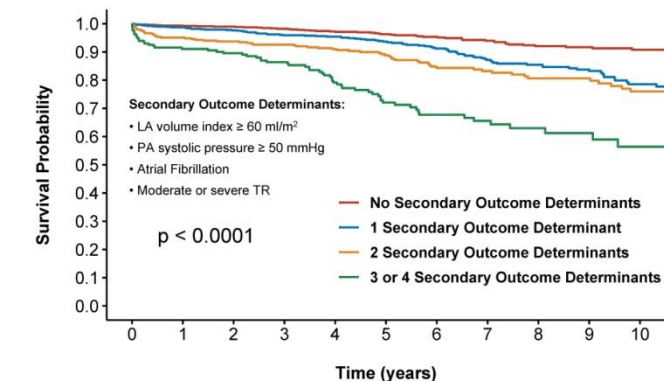


Morfologie mitrální chlopně –pravděpodobnost proveditelnosti MVP

	Ideal Pathoanatomy	Challenging Pathoanatomy	Relative Pathoanatomic Contraindication
Primary Lesion Location	Posterior leaflet only	Anterior leaflet or bileaflet	None
Leaflet Calcification	None	Mild	Moderate to severe
Annular Calcification	None	Mild to moderate with minimal leaflet encroachment	Severe or with significant leaflet encroachment
Subvalvular Apparatus	Thin, normal	Mild diffuse thickening or moderate focal thickening	Severe and diffuse thickening with leaflet retraction
Mechanism of MR	Type II fibroelastic deficiency or focal myxomatous prolapse or flail	Type II <i>forme fruste</i> or bileaflet myxomatous (Barlow's) disease; Type I healed or active endocarditis; Type IIIA/B with mild restriction or leaflet thickening	Type IIIB with severe tethering and inferobasal aneurysm; Type IIIB with severe bileaflet calcification; Type I active infection with severe leaflet or annular tissue destruction
Unique Anatomic Complexities	None	Redo cardiac operation or mitral re-repair; anatomic predictors of systolic anterior motion (e.g., septal hypertrophy); adult congenital anomalies; focal papillary muscle rupture	MV reoperation with paucity of leaflet tissue; diffuse radiation valvulopathy; papillary muscle rupture with shock

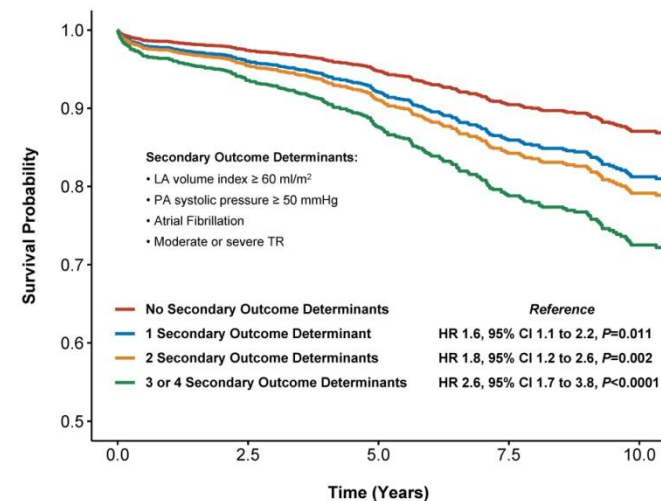


Sekundární markery u PMR



Number at risk

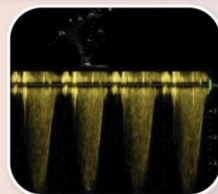
874	844	813	767	648	547	459	377	300	226	170
795	747	701	640	538	425	349	277	215	167	105
391	356	337	312	272	218	179	146	109	93	72
216	184	174	160	122	94	72	54	38	28	19



Secondary outcome determinants in DMR



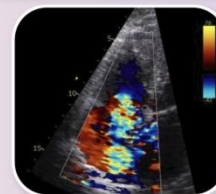
LAVI ≥ 60 ml/m²



sPAP ≥ 50 mmHg



Atrial fibrillation



$\geq$ moderate FTR

Independent of

Age

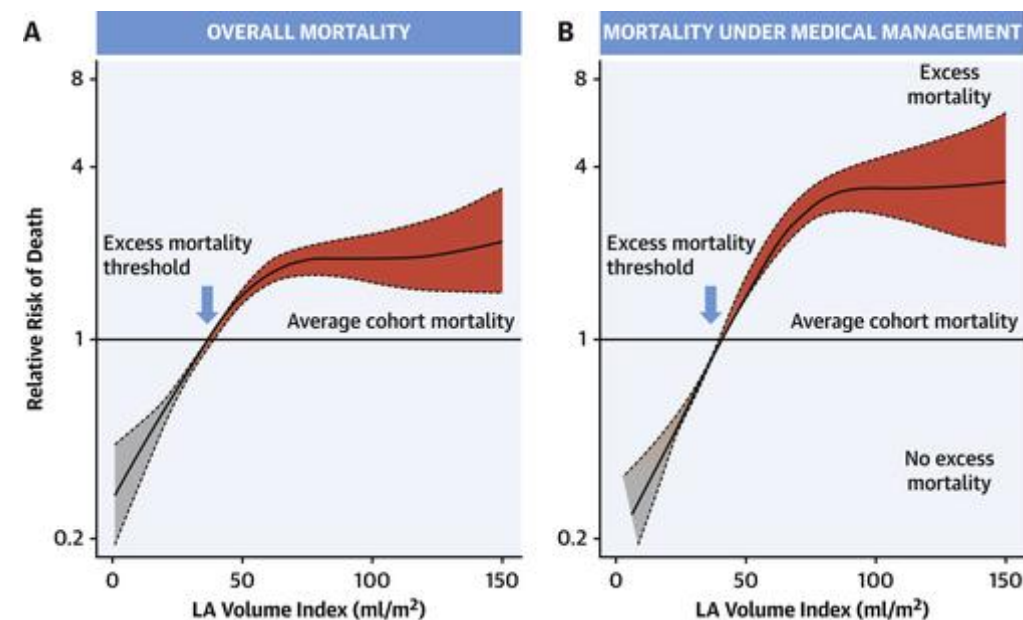
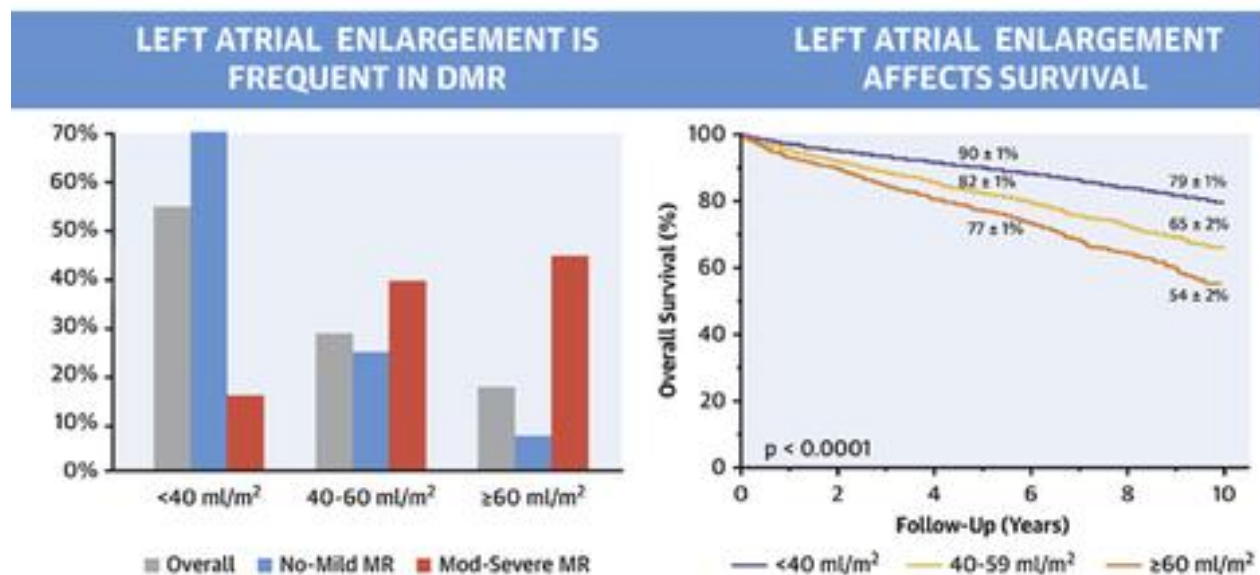
Class I surgical indications

Surgical risk

US or European origin

Pacienti s významnou MR s fenotypem více sekundárních markerů mají horší prognózu a měla by u nich být zvažována časná operace mitrální chlopně

Primární mitrální regurgitace - prognostický význam velikosti levé síně



PMR - doporučení

Recommendations	Class	Level
MV repair is the recommended surgical technique to treat patients with severe PMR when the result is expected to be durable.	I	B
MV surgery is recommended in symptomatic patients with severe PMR considered operable by the Heart Team.	I	B
MV surgery is recommended in asymptomatic patients with severe PMR and LV dysfunction (LVESD ≥ 40 mm or LVESDi ≥ 20 mm/m ² or LVEF $\leq 60\%$).	I	B
Surgical MV repair is recommended in low-risk asymptomatic patients with severe PMR without LV dysfunction (LVESD < 40 mm, LVESDi < 20 mm/m ² , and LVEF $> 60\%$) when a durable result is likely, if at least three of the following criteria are fulfilled: -AF -SPAP at rest > 50 mmHg -LA dilatation (LAVI ≥ 60 mL/m ² or LA diameter ≥ 55 mm) -Concomitant secondary TR $\geq$ moderate.	I	B

Nově

Nově

PMR - doporučení

Recommendations	Class	Level
MV surgery should be considered in asymptomatic patients with severe PMR without LV dysfunction (LVESD <40 mm, LVESDi <20 mm/m ² , and LVEF >60%) in the presence of PH (SPAP at rest >50 mmHg), or AF secondary to MR.	Ila	B
Surgical MV repair should be considered in low-risk asymptomatic patients with severe PMR without LV dysfunction (LVESD <40 mm, LVESDi <20 mm/m ² , and LVEF >60%) in the presence of significant LA dilatation (LAVI ≥60 mL/m ² or LA diameter ≥55 mm), when performed in a Heart Valve Centre and a durable repair is likely.	Ila	B

Rev

Rev

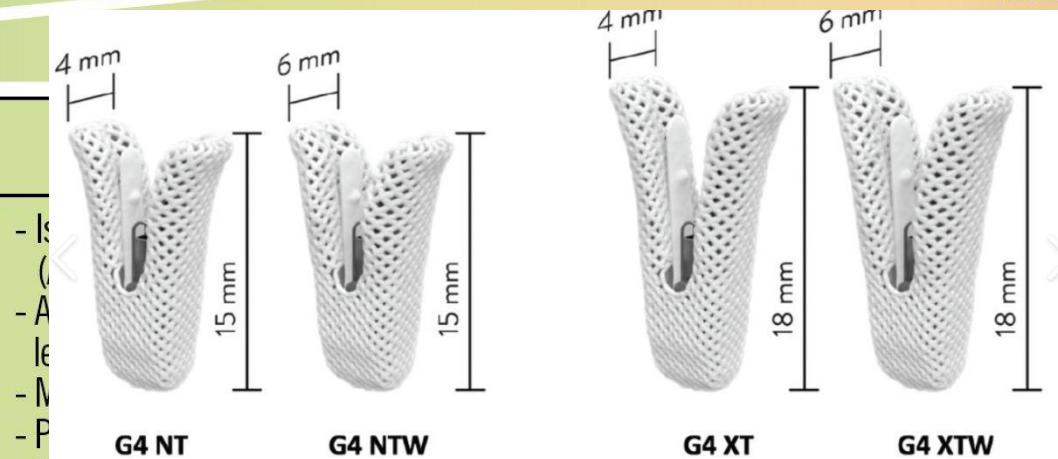
PMR a TEER

Repair!

Anatomical suitability for M-TEER

**Non-complex
Ideal for M-TEER**

- Central pathology
- No calcification
- MVA $>4.0 \text{ cm}^2$
- Posterior leaflet $>10 \text{ mm}$
- Tenting height $<10 \text{ mm}$
- Flail gap $<10 \text{ mm}$
- Flail width $<15 \text{ mm}$



- Asymmetric tethering²⁶
- Coaptation reserve $<3 \text{ mm}$ ²⁴
- Leaflet-to-anulus index <1.2 ²⁵
- Flail width $>15 \text{ mm}$
- Flail gap $>10 \text{ mm}$
- Two jets from leaflet indentations

- MVA $3.0\text{--}3.5 \text{ cm}^2$
- Posterior leaflet length $5\text{--}7 \text{ mm}$
- Barlow's disease
- Cleft
- Failed surgical annuloplasty

Centre experience

Replacement?

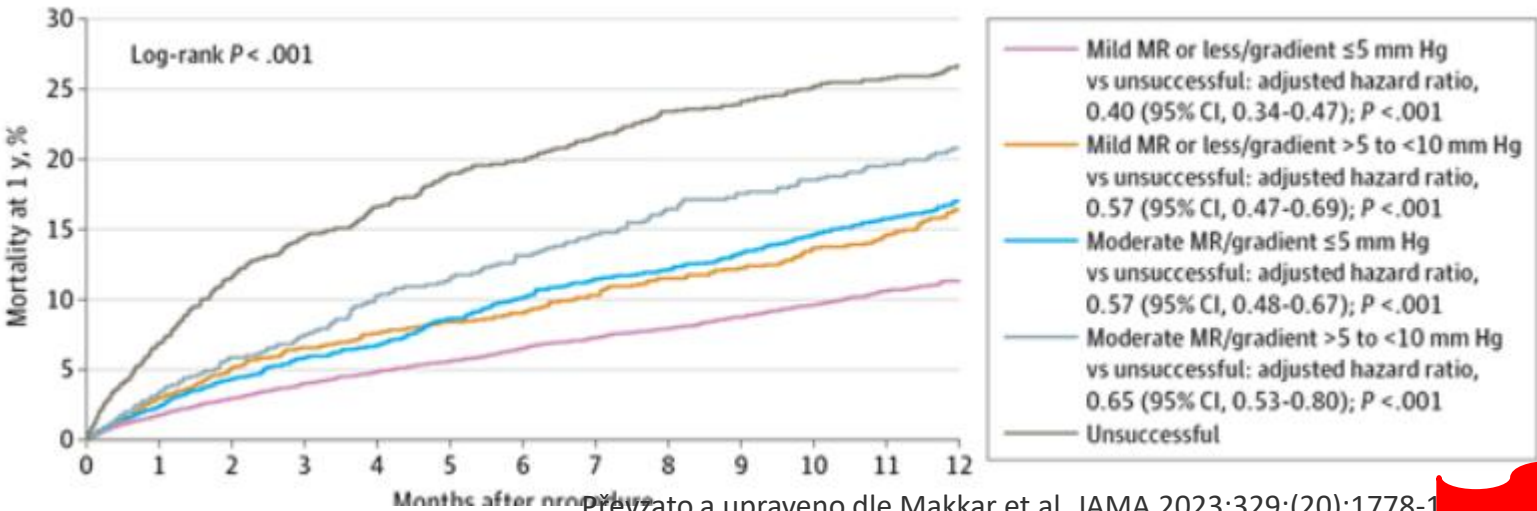
**Criteria favouring replacement
M-TEER hard or impossible**

- Concentric MAC with stenosis
- MVA $<3.0 \text{ cm}^2$
- Relevant mitral valve stenosis (mean gradient $>5 \text{ mmHg}$)
- Posterior leaflet $<5 \text{ mm}$
- Calcification in the grasping zone
- Deep regurgitant cleft
- Leaflet perforation
- Multiple/wide jets
- Rheumatic mitral stenosis

PMR a TEER

19 088 pacientů
úspěšná TEER u 88,9%
nejnižší mortalita ve skupině s malou reziduální MR a nízkým PG mean po TEER

Mean mitral valve gradient, mm Hg	≥10	Unsuccessful procedure		2067/18 766 (11.0%)
	>5 to <10	Mild MR or less and mitral gradient 5-10 mm Hg 2221/18 766 (11.8%)	Moderate MR and mitral gradient 5-10 mm Hg 1207/18 766 (6.4%)	Unsuccessful procedure
	≤5	Mild MR or less and mitral gradient ≤5 mm Hg 9824/18 766 (52.4%)	Moderate MR and mitral gradient ≤5 mm Hg 3447/18 766 (18.4%)	
		Mild MR or less	Moderate MR	Higher than moderate MR
		Residual MR		



Převzato a upraveno dle Makkar et al. JAMA 2023;329;(20):1778-1

TEER should be considered in symptomatic patients with severe PMR who are anatomically suitable and at high surgical risk according to the Heart Team.

Ila

B

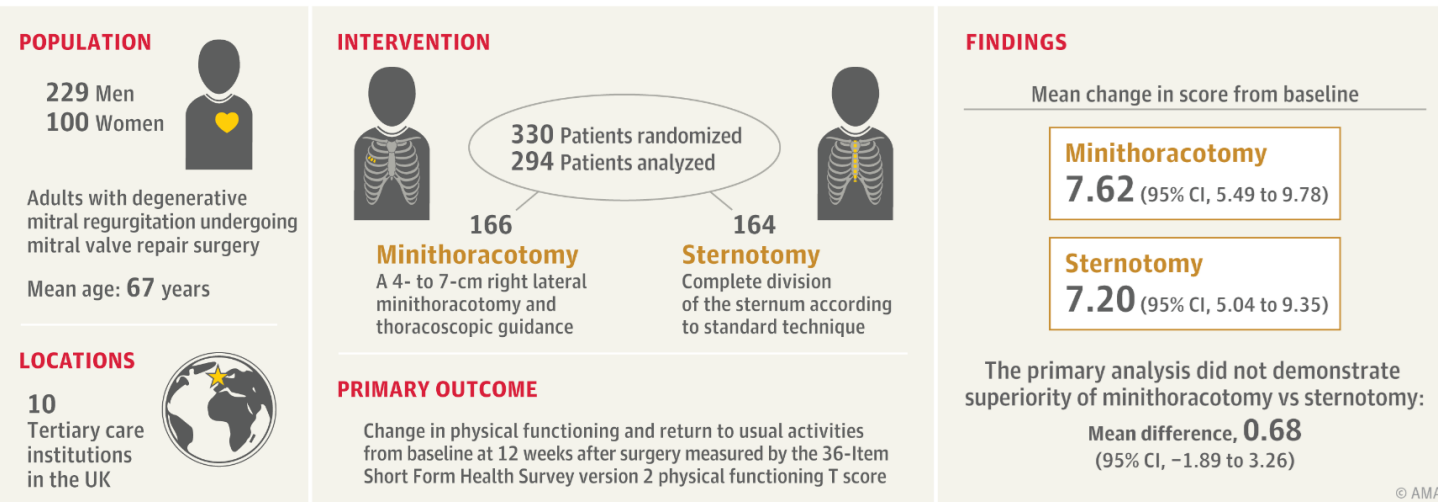


PMR - doporučení

JAMA

QUESTION Is minimally invasive mitral valve repair better at improving physical function at 12 weeks than conventional sternotomy mitral valve repair for degenerative mitral regurgitation?

CONCLUSION Minithoracotomy is not superior to sternotomy in recovery of physical function at 12 weeks. The results provide evidence to inform shared decision-making and treatment guidelines.



Nově

Recommendations

Minimally invasive MV surgery may be considered at experienced centres to reduce the length of stay and accelerate recovery.

Class	Level
IIb	B

Sledování pacientů léčených konzervativně

Pacienti neindikovaní k intervenci:

Významná asymptomatická PMR - 2x ročně

echokardiografie, EKG a NT pro BNP

Středně významná asymptomatická PMR

echokardiografie, EKG a NT pro BNP každý 1-2 roky

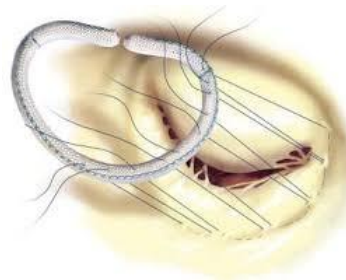


Po KCH výkonu

MVP a zchovalá EF LK,SR : echo, EKG každé 2-3 roky

MVP a snížená EF a arytmie : echo, EKG každý rok

MVR : echo a EKG +x ročně



TEER

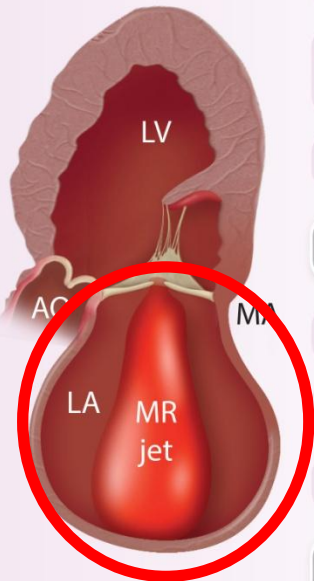
Echokardiografie a EKG 1x ročně



Sekundární mitrální regurgitace

Sekundární mitrální regurgitace

Atrial SMR



Key criteria

LVEF $\geq 50\%$ without regional wall motion abnormalities

No or mildly dilated LV cavity^a without leaflet tethering

Mitral annulus dilatation (AP > 35 mm)

Enlarged LA (LAVI > 34 mL/m²)

LVEF $< 50\%$ with or without regional wall abnormalities

Restrictive leaflet motion with tethering

Normal leaflet morphology

Central or eccentric jet

Additional echocardiographic criteria^b

Normal leaflet motion

Normal leaflet morphology

Usually central jet

Dilated LV

Dilated LA

Dilated MV annulus

Additional clinical criteria

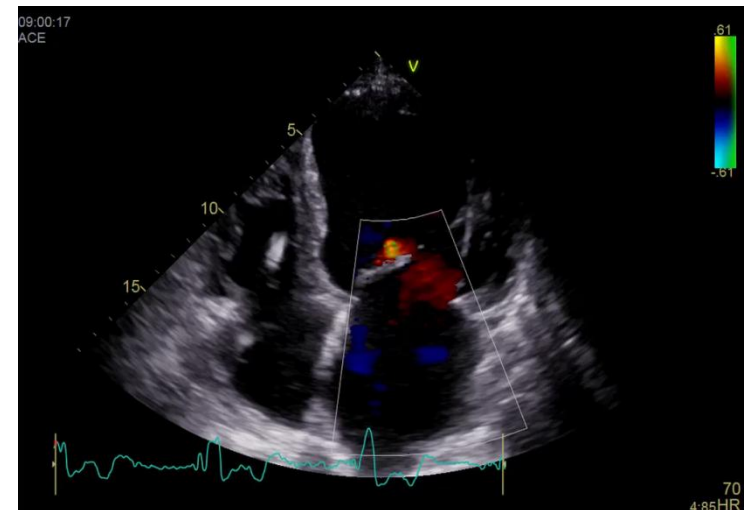
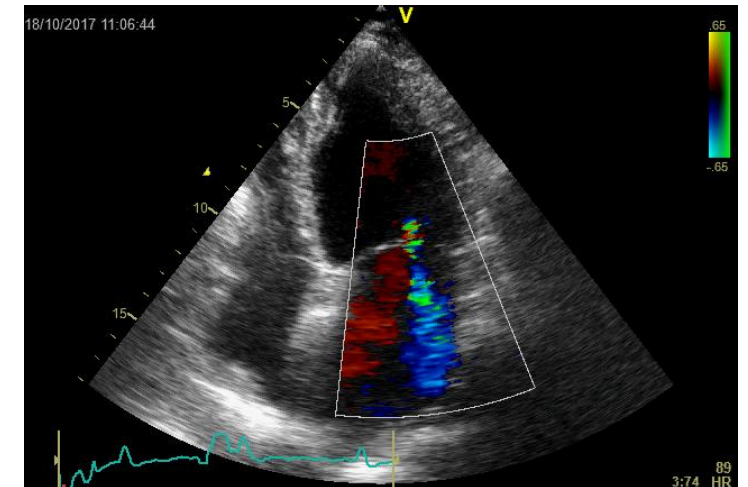
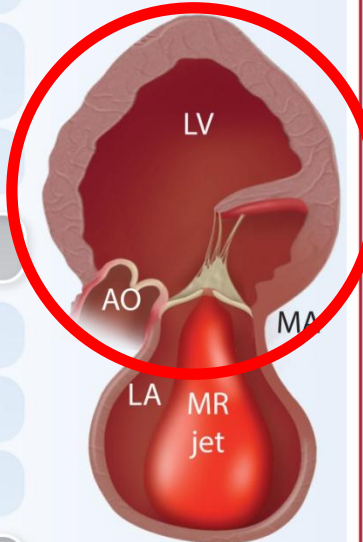
Atrial fibrillation

HFpEF

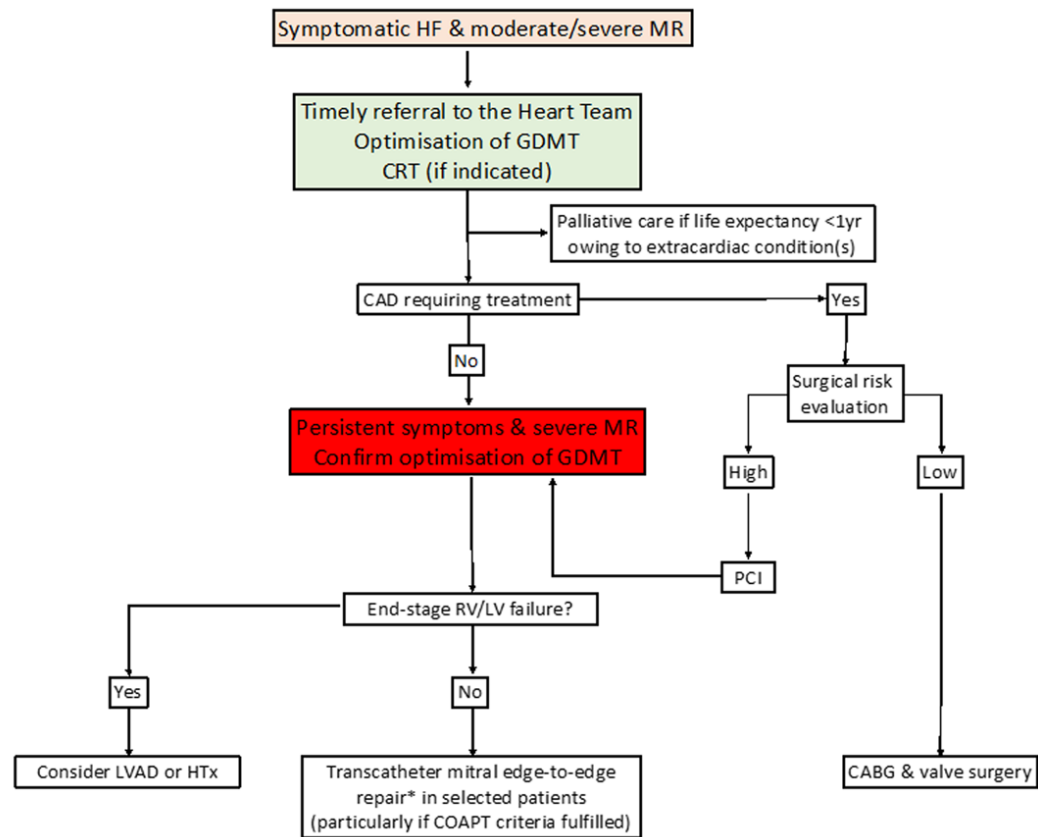
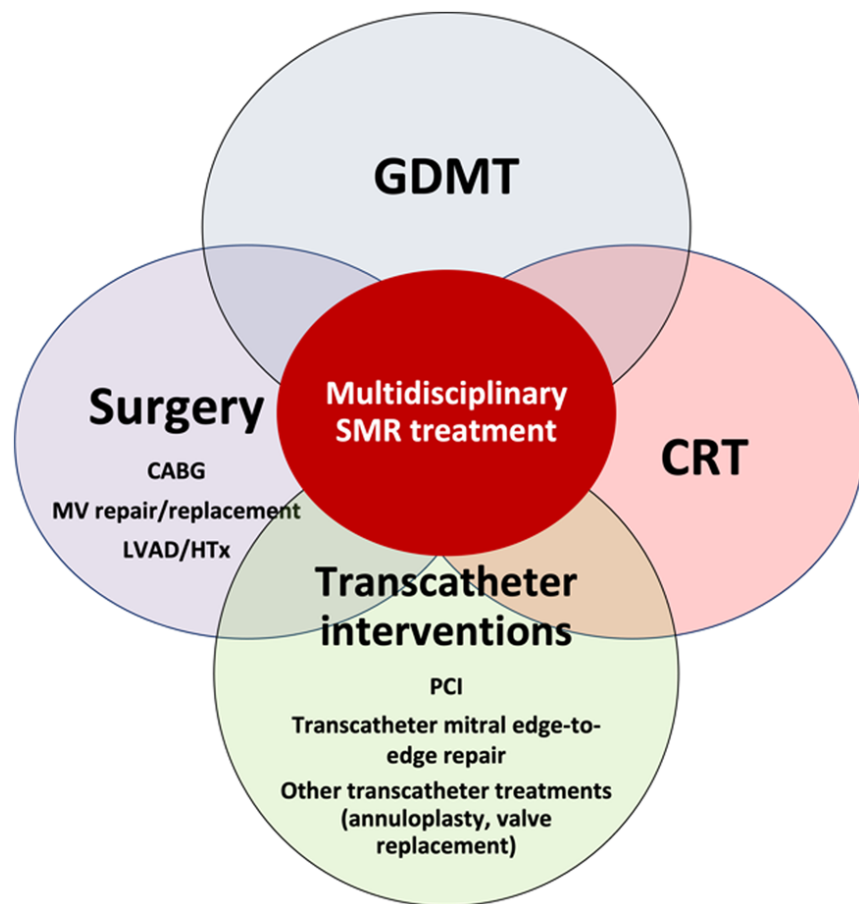
Ischaemic heart disease

Dilated cardiomyopathy

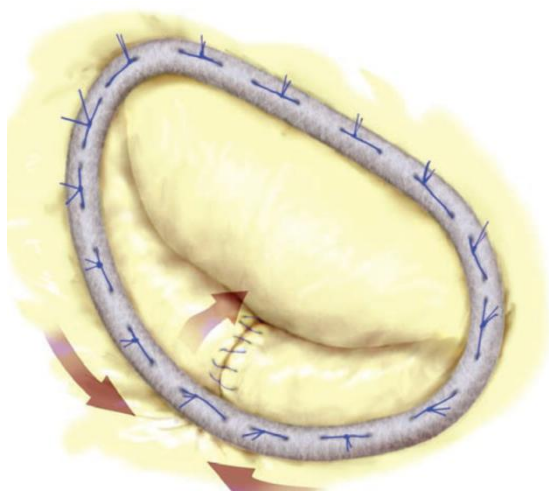
Ventricular SMR



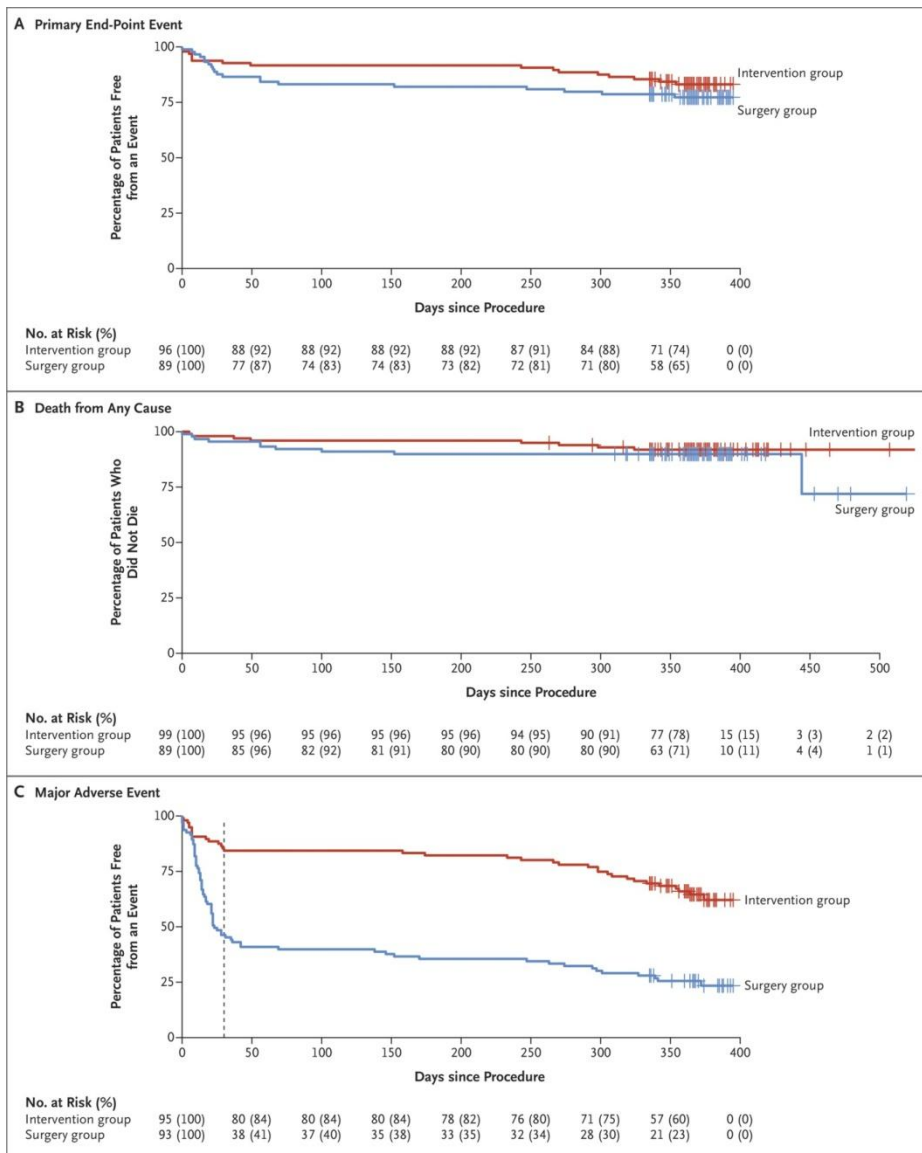
Postup u pacientů se SMR



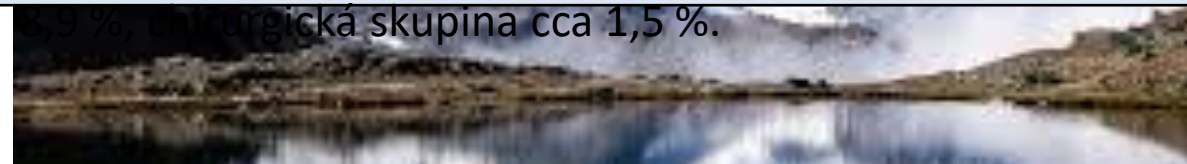
Postup u pacientů se SMR



Sekundární mitrální regurgitace



- **Primární composite endpoint:** úmrtí pro jakoukoli příčinu, hospitalizace pro HF, re-intervence chlopně , CMP po 1 roce:
TEER skupina: 16,7 % , Chirurgická skupina: 22,5 % - tj. splněna noninferiorita pro TEE
- **Bezpečnostní endpoint (30 dní):** TEER: ~14,9 % vs chirurgická skupina ~54,8 %.
- **Rekurence MR $\geq 3+$ po 1 roce:** TEER skupina cca 9 % , Chirurgická skupina cca 1,5 %.



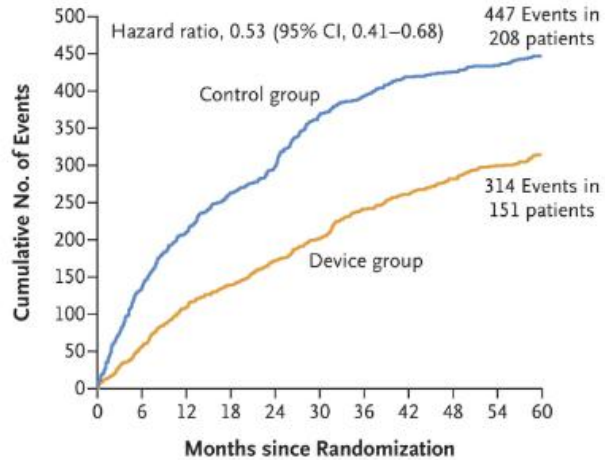
- MATTERHORN -u některých pacientů se SMR může být **TEER** realistickou alternativou k operaci, srovnatelnou účinností (v rámci 1 roku) a s lepším bezpečností zvl. u pacientů s vyšším chirurgickým rizikem.
- Subanalýza pro **ASMR** naznačuje, že TEER může být u této skupiny též použitelný, ovšem s opatrností vzhledem k vyšší míře recidivy MR; výhoda v bezpečnosti je výrazná.

Ventrikulární SMR - klíčové studie

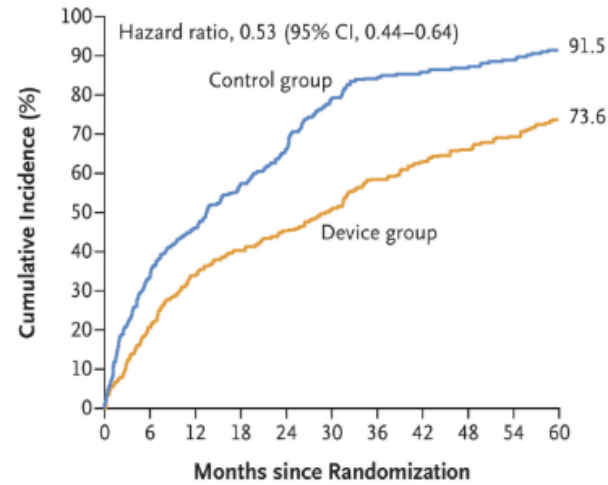
COAPT

RESHAPE

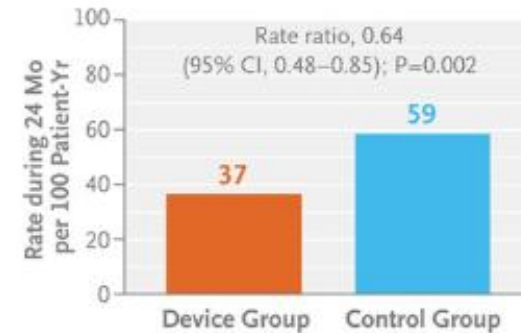
A Hospitalizations for Heart Failure



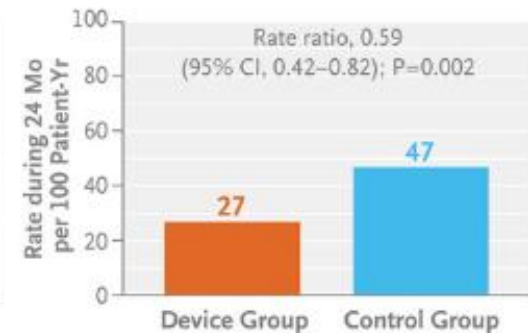
D Death from Any Cause or First Hospitalization for Heart Failure



Hospitalization for Heart Failure or Cardiovascular Death



Hospitalization for Heart Failure



- COAPT (2018, 5leté výsledky 2023): - TEER + GDMT ↓ mortalitu a hospitalizace HF
- MITRA-FR (2018): - bez benefitů (pokročilejší LV dilatace, méně disproporcionální MR)
- RESHAPE-HF2 (2024): - TEER + GDMT ↓ hospitalizace HF, zlepšení QoL
- Registry (COAPT-PAS, EuroSMR): - Potvrzení efektu v reálné praxi

Klinická a echokardiografická kritéria predikující efekt TEER u ventrikulární SMR

Anatomie považována za vhodnou pro M-TEER

NYHA třída $\geq$ II

LVEF 20%–50%

LVESD $\leq$ 70 mm

Alespoň jedna hospitalizace pro srdeční selhání v uplynulém roce nebo zvýšené hladiny natriuretického peptidu (BNP $\geq$ 300 pg/mL nebo NT-proBNP $\geq$ 1000 pg/mL)

SPAP $\leq$ 70 mmHg

Vyloučení těžké dysfunkce pravé komory

Vyloučení stadia D nebo pokročilého srdečního selhání

Vyloučení ICHS vyžadující revaskularizaci

Vyloučení významné aortální nebo trikuspidální vady

Vyloučení hypertrofické, restriktivní nebo infiltrativní kardiomyopatie

Ventrikulární SMR strategie léčby TEER

Vhodný pacient

SMR: těžká ($\text{EROA} \geq 30\text{--}40 \text{ mm}^2$, $\text{RVol} \geq 45\text{--}60 \text{ ml}$)

LVEF: 20–50 %

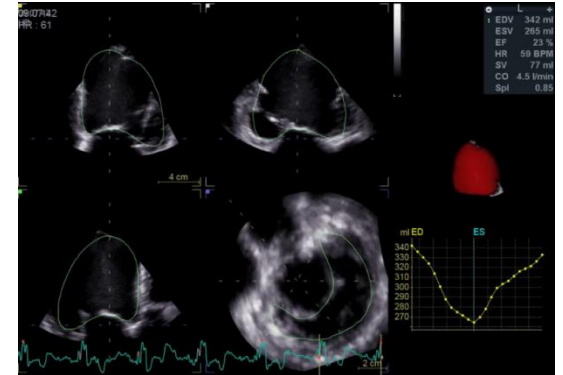
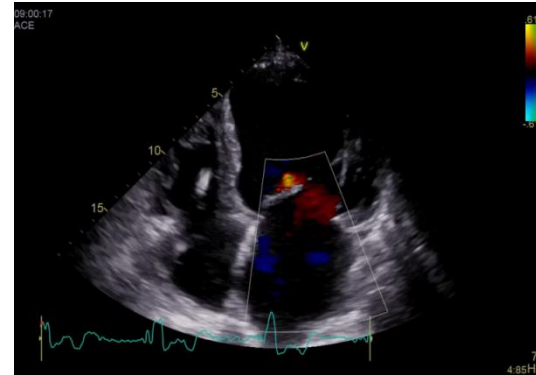
LVEDD: $\leq 70 \text{ mm}$

sPAP: $< 70 \text{ mmHg}$

Pravá komora: bez těžké dysfunkce

Anatomie chlopně: vhodná pro TEER

Chirurgie: kontraindikovaná / vysoce riziková



Nevhodný pacient

Střední MR

LVEF $< 15\text{--}20 \%$ nebo $> 50 \%$

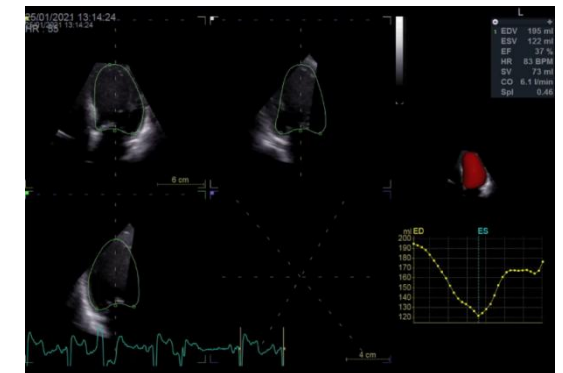
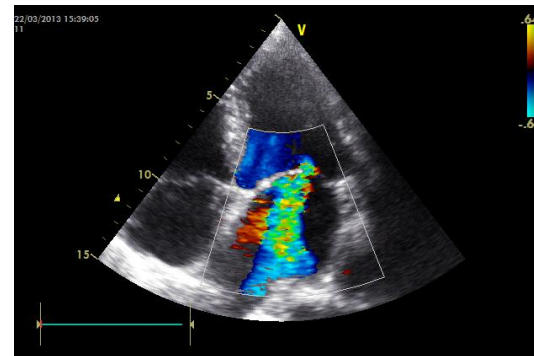
LVEDD $> 70 \text{ mm}$

Těžká PH (sPAP $> 70 \text{ mmHg}$)

Těžká dysfunkce PK

Nevhodná anatomie chlopně

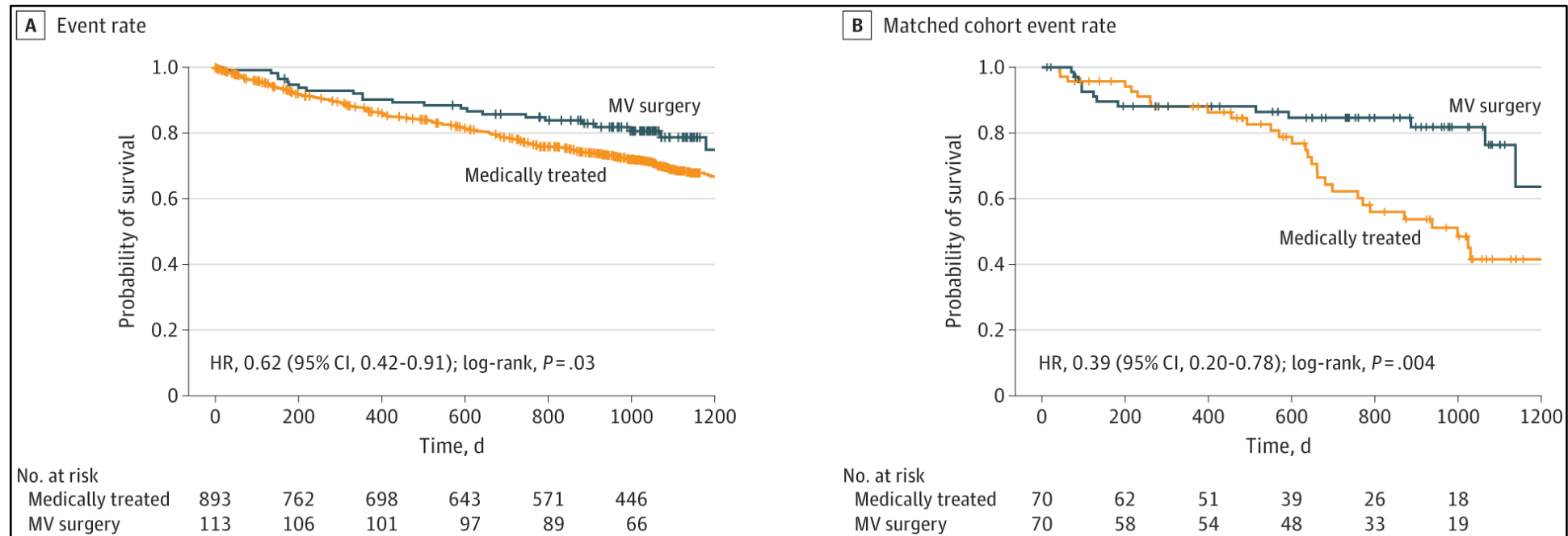
Terminální HF, krátká prognóza



Významná ventrikulární SMR- doporučení

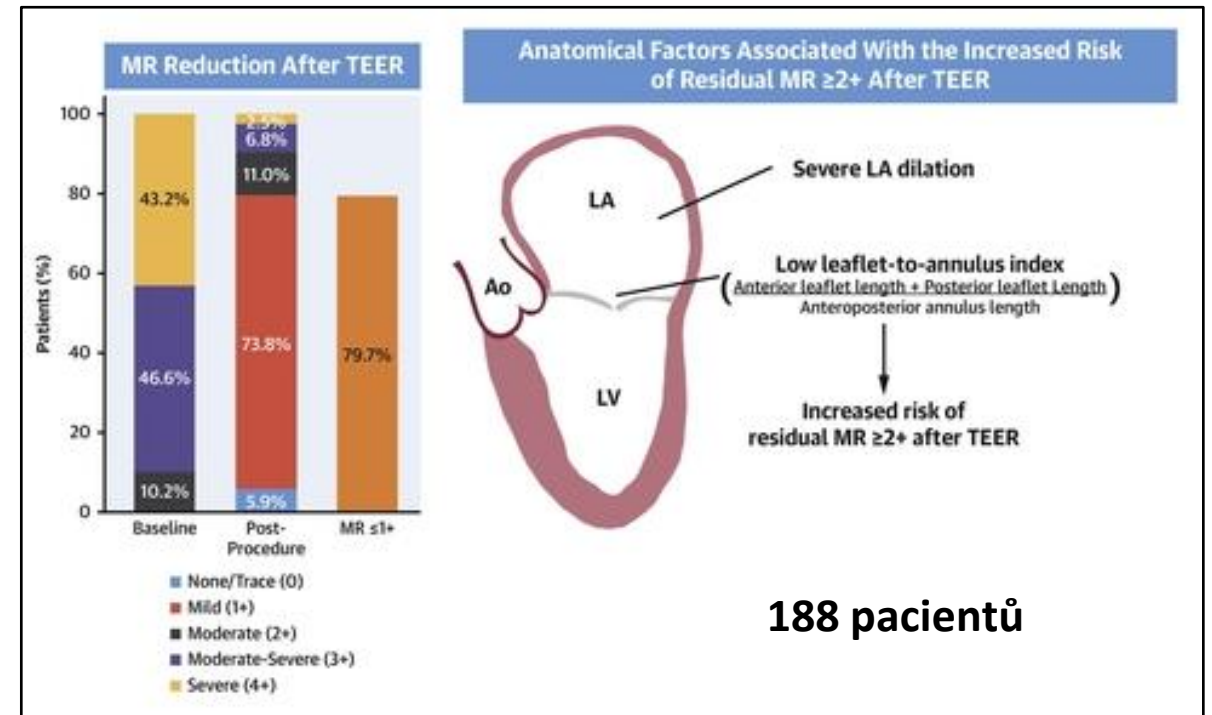
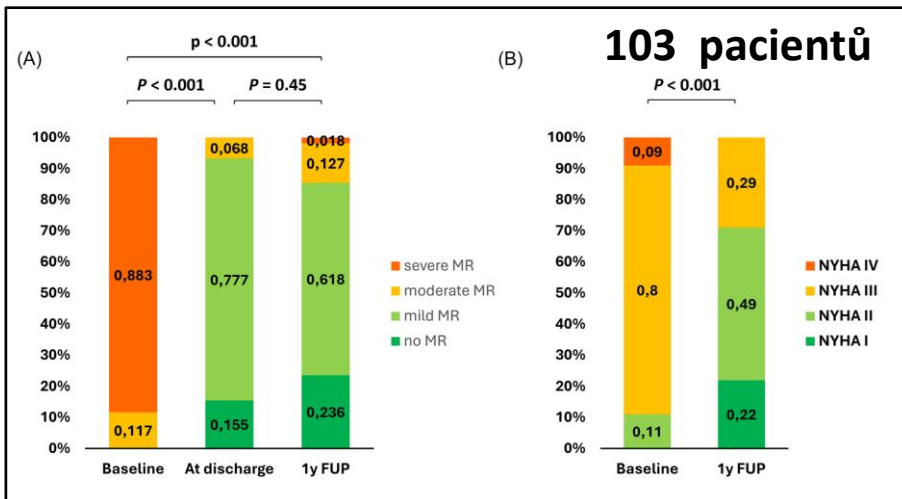
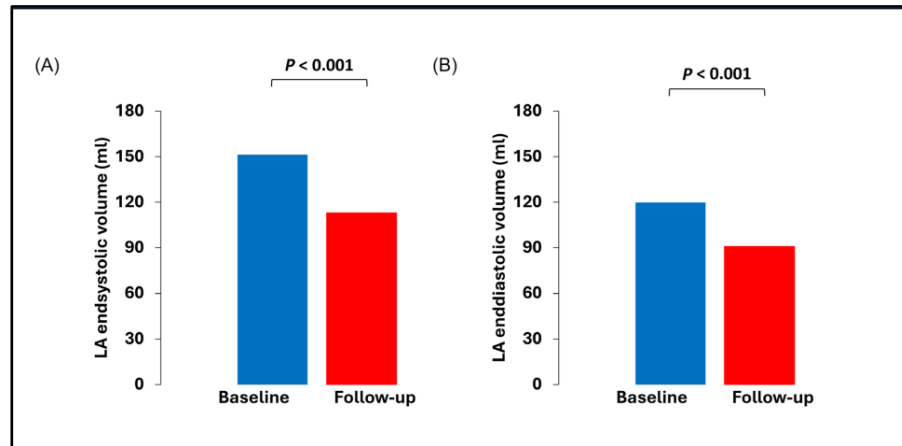
Recommendations	Class	Level	
Severe ventricular secondary mitral regurgitation without concomitant coronary artery disease			
TEER is recommended to reduce HF hospitalizations and improve quality of life in haemodynamically stable, symptomatic patients with impaired LVEF (<50%) and persistent severe ventricular SMR, despite optimized GDMT and CRT (if indicated), fulfilling specific clinical and echocardiographic criteria.	I	A	Rev
TEER may be considered for symptom improvement in selected symptomatic patients with severe ventricular SMR not fulfilling the specific clinical and echocardiographic criteria, after careful evaluation of LVAD or HTx.	IIb	B	Rev
MV surgery may be considered in symptomatic patients with severe ventricular SMR without advanced HF who are not suitable for TEER.	IIb	C	Rev
Severe ventricular secondary mitral regurgitation and concomitant coronary artery disease			
MV surgery is recommended in patients with severe ventricular SMR undergoing CABG.	I	B	Nově
MV surgery may be considered in patients with moderate SMR undergoing CABG.	IIb	B	
PCI followed by TEER after re-evaluation of MR may be considered in symptomatic patients with chronic severe ventricular SMR and non-complex CAD.	IIb	C	Rev

Atriální sekundární MR



- REVEAL-AFMR potvrzuje, že AFMR není vzácná a může mít vysokou morbiditu a mortalitu, pokud je léčena pouze medikamentózně.
- poklad pro guidelines ke zvážení operace i u AFMR, obzvlášť u relativně mladších, s významnou MR a symptomy
- přítomnost těžké trikuspidální regurgitace zhoršuje prognózu; vhodné řešit současně i TR

Atriální sekundární MR

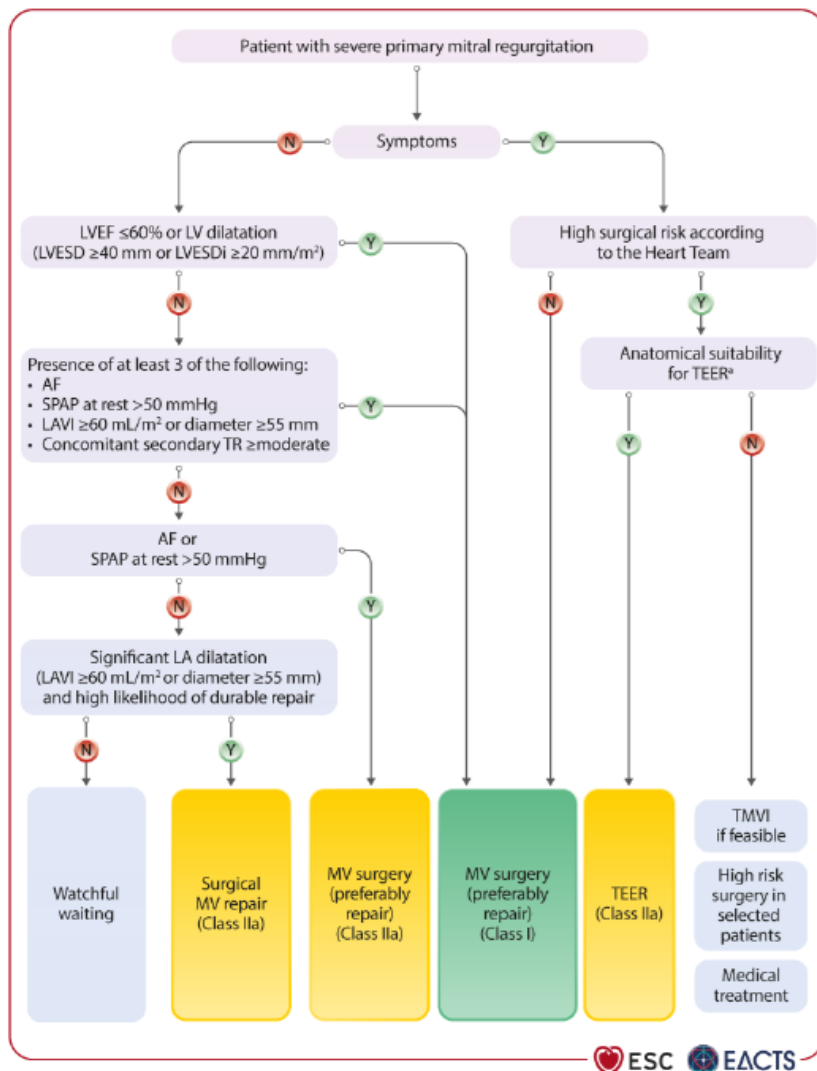


188 pacientů

Významná atriální SMR- doporučení

Recommendations	Class	Level
Severe atrial secondary mitral regurgitation		
MV surgery, surgical AF ablation, if indicated, and LAAO should be considered in symptomatic patients with severe atrial SMR under optimal medical therapy.	Ila	B 
TEER may be considered in symptomatic patients with severe atrial SMR not eligible for surgery after optimization of medical therapy including rhythm control, when appropriate.	Ilb	B 

Mitrální regurgitace- klíčové body

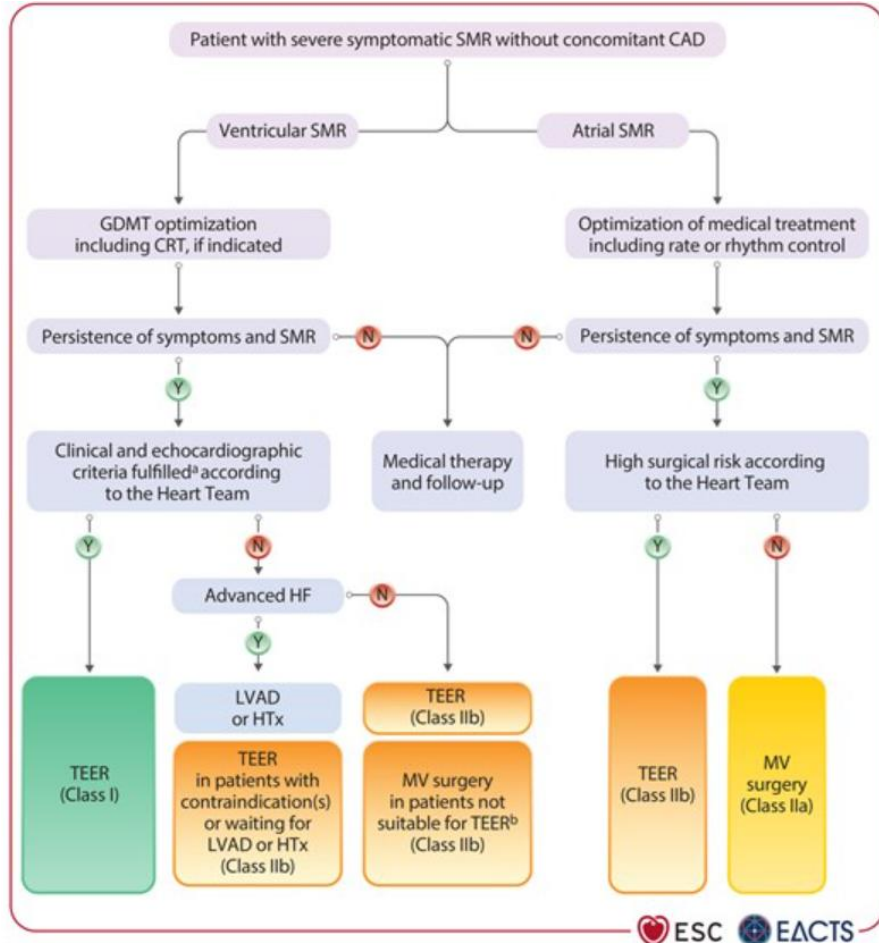


■ **Echokardiografie** u pacientů s MR zahrnuje multiparametrické hodnocení významnosti MR, zhodnocení anatomie (vč. 3D TEE), identifikaci mechanismu (PMR, komorová /atriální SMR) a vyhodnocení funkce LK a PK

■ **MVP** je preferovanou metodou léčby u závažné PMR. TEER se doporučuje u pacientů, kteří jsou podle Heart Team neoperovatelní nebo vysoce rizikoví.

■ **MVP** je metodou volby u asymptomatických pacientů s primární MR a známkami poškození myokardu, včetně středně těžké/ těžké TR.

Mitrální regurgitace- klíčové body



■ U pacientů s **komorovou SMR** je GDMT (vč. CRT, je-li indikována) počátečním a nezbytným krokem léčby. U symptomatických pacientů bez CAD se doporučuje M-TEER. U pacientů se souběžnou komplexní CAD a u pacientů, kteří nejsou vhodní pro TEER, lze zvážit mitrální chirurgický zákrok.

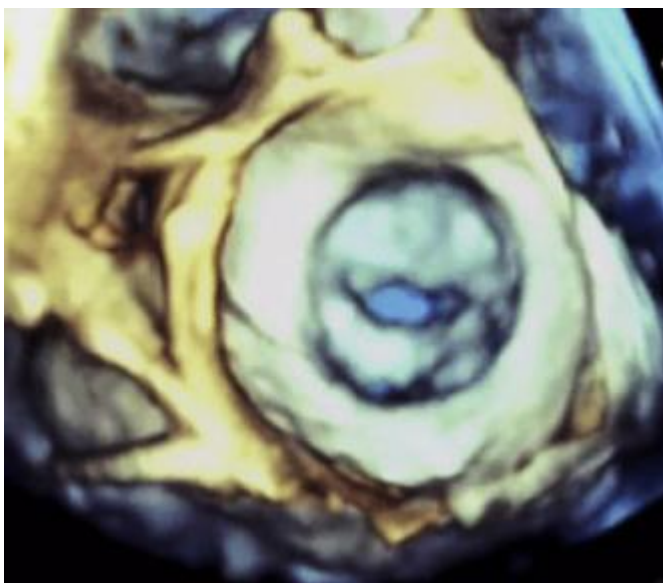
■ U pacientů s **atriální SMR** by po optimalizaci medikamentózní léčby měla být zvážena chirurgická léčba MV, ablace AF, pokud je indikována, a LAAO. U pacientů s vysokým chirurgickým rizikem lze zvážit TEER.

Mitrální stenóza

Mitrální stenóza

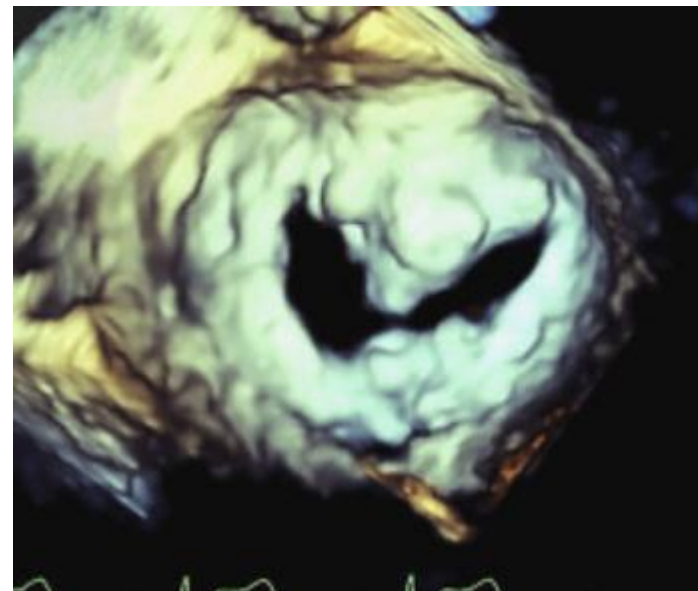
Porevmatická

rozvojové země
mladší pacienti, stále ovlivňuje globální
mortalitu na srdeční onemocnění
rozvinuté země relativně vzácná



Degenerativní

v souvislosti s kalcifikací mitrálního
anulu
starší pacienti

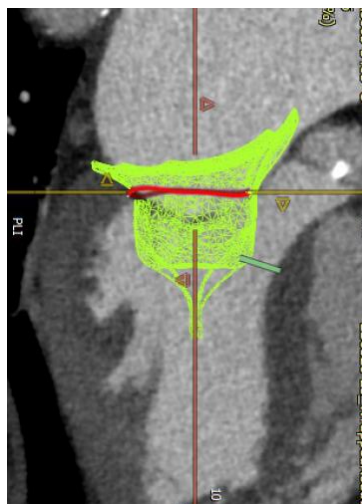
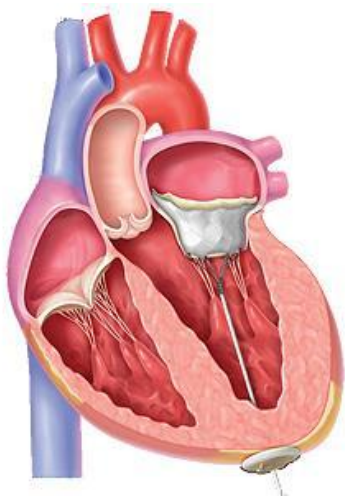
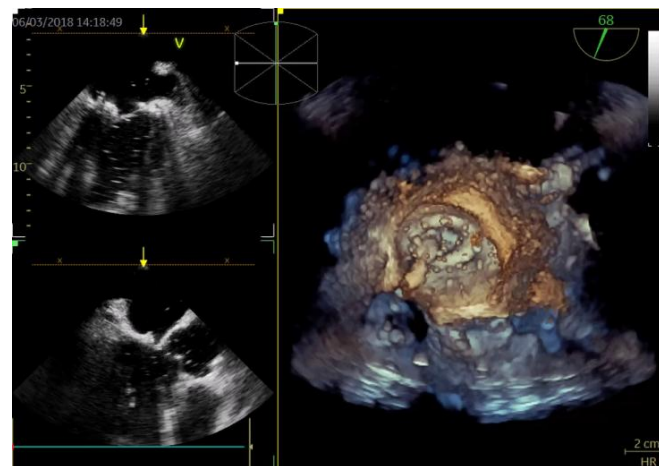
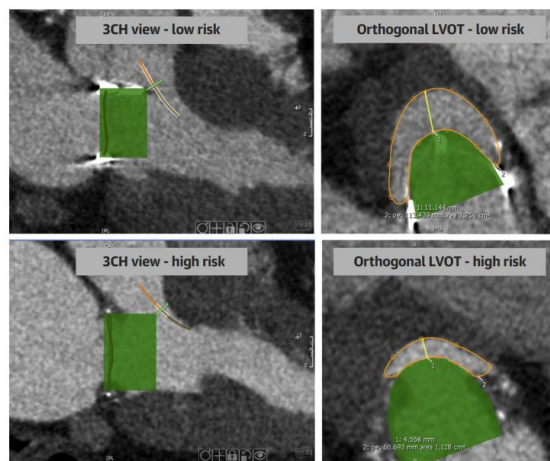
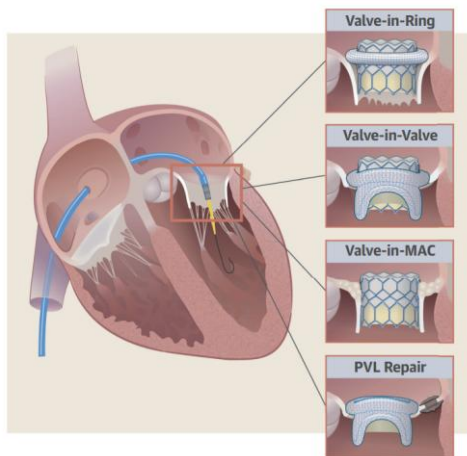


Indikace k výkonům u pacientů s významnou MS

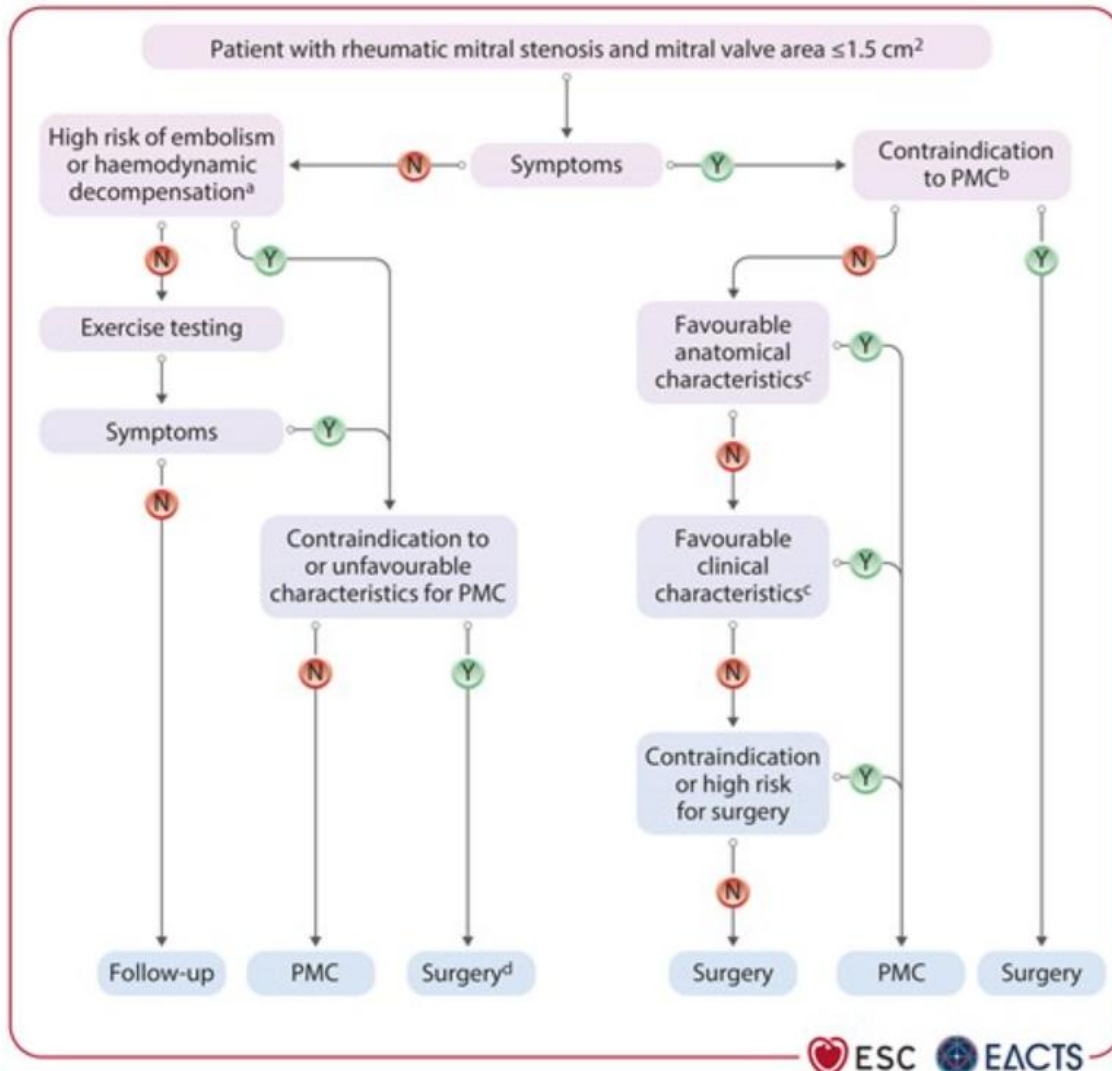
Recommendations	Class	Level
PMC is recommended in symptomatic patients in the absence of unfavourable characteristics for PMC.	I	B
PMC is recommended in any symptomatic patients with a contraindication or at high risk for surgery.	I	C
MV surgery is recommended in symptomatic patients who are not suitable for PMC.	I	C
PMC should be considered as initial treatment in symptomatic patients with suboptimal anatomy but no unfavourable clinical characteristics for PMC.	IIa	C
PMC should be considered in asymptomatic patients without unfavourable clinical and anatomical characteristics for PMC and:		
•High thrombo-embolic risk (history of systemic embolism, dense spontaneous contrast in the LA, new-onset or paroxysmal AF), and/or	IIa	C
•High risk of haemodynamic decompensation (SPAP >50 mmHg at rest, need for major NCS, pregnant or desire for pregnancy).		
TMVI may be considered in symptomatic patients with extensive MAC and severe MV dysfunction at experienced Heart Valve Centres with expertise in complex MV surgery and transcatheter interventions.	IIb	C

Nově

Katetrizační náhrady mitrální chlopně



Klíčové body MS



- Většina pacientů s těžkou revmatickou MS a příznivou anatomií chlopně by měla podstoupit PMC, což je standardní léčba.
- Operace se doporučuje u symptomatických pacientů s kontraindikacemi nebo nepříznivými anatomickými a klinickými charakteristikami pro PMC.
- Při rozhodování u pacientů s nepříznivou anatomií je třeba zohlednit místní zkušenosti s PMC.

Trikuspidální regurgitace

Trikuspidální regurgitace

Nově

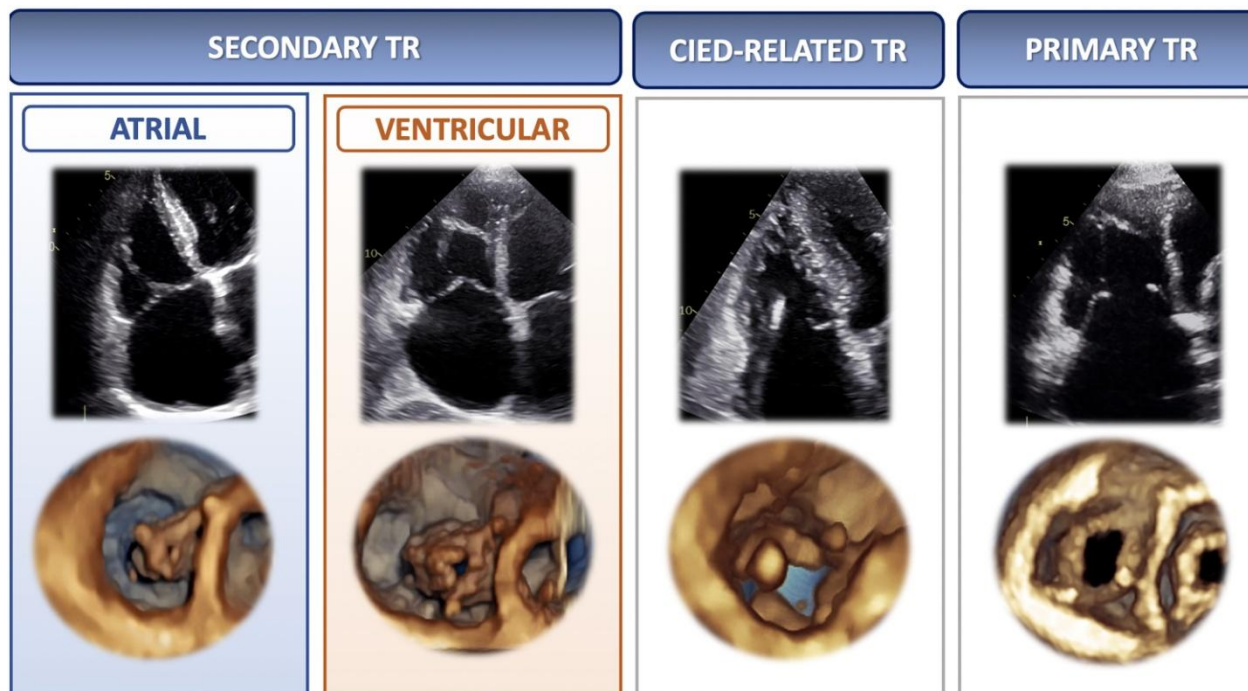
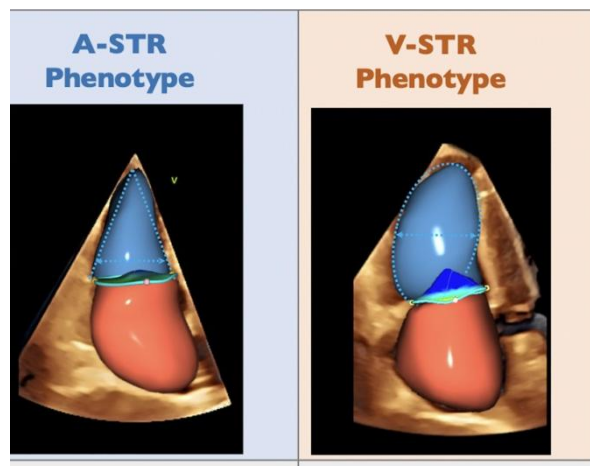
Recommendations

Careful evaluation of TR aetiology, stage of the disease (i.e. degree of TR severity, RV and LV dysfunction, and PH), patient operative risk, and likelihood of recovery by a multidisciplinary Heart Team is recommended in patients with severe TR prior to intervention.

Class Level

I

C

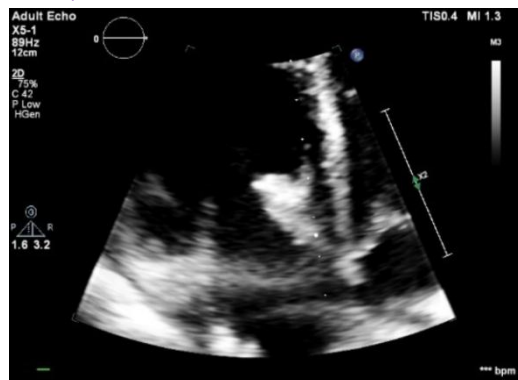


Etiologie- mechanismus TR

Primární



Ebsteinova anomálie

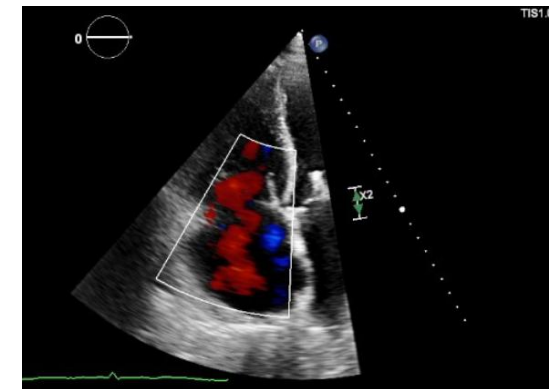


Infekční endokarditida



Interference s elektrodou

Sekundární



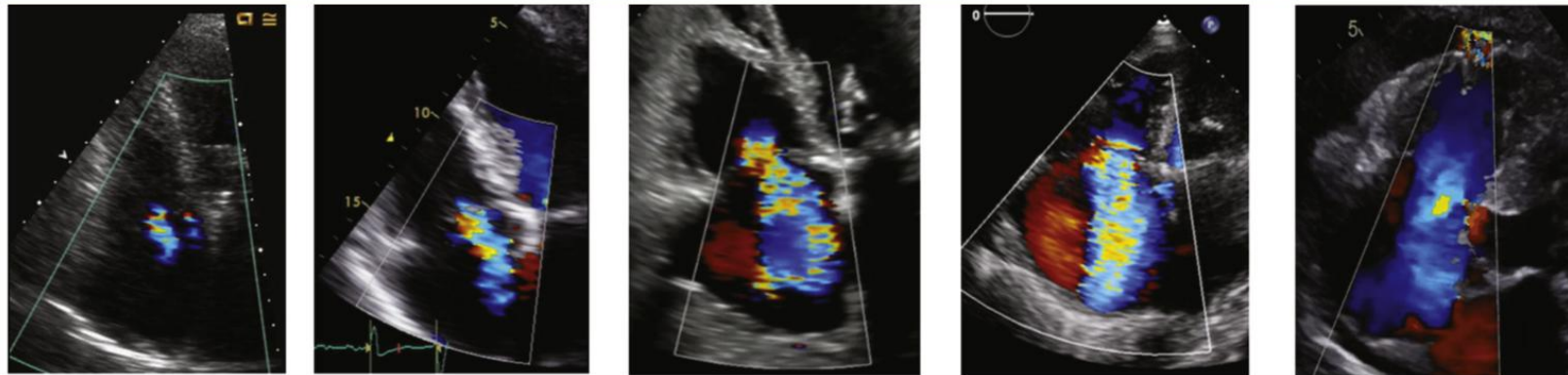
Funkční regurgitace- fenotyp:
ventrikulární x atriální



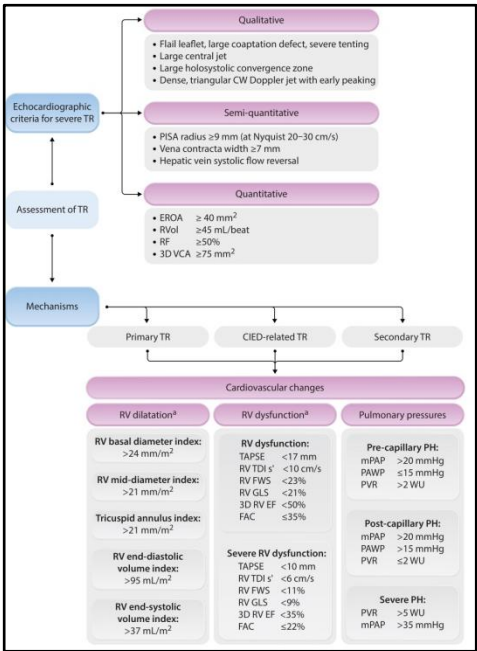
Hodnocení významnosti TR

Parameters	MILD	MODERATE	SEVERE	MASSIVE	TORRENTIAL
Vena Contracta width (biplane average)	<3 mm	3-6.9 mm	7 mm - 13 mm	14-20 mm	≥21 mm
EROA by PISA	<20 mm ²	20-39 mm ²	40-59 mm ²	60-79 mm ²	≥80 mm ²
3D Vena Contracta Area or Quantitative Doppler EROA	-	-	75-94 mm ²	95-114 mm ²	≥115 mm ²

Example:



Kritéria významné trikuspidální regurgitace - 2D echokardiografie



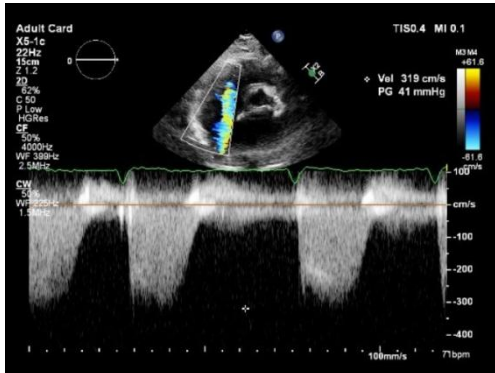
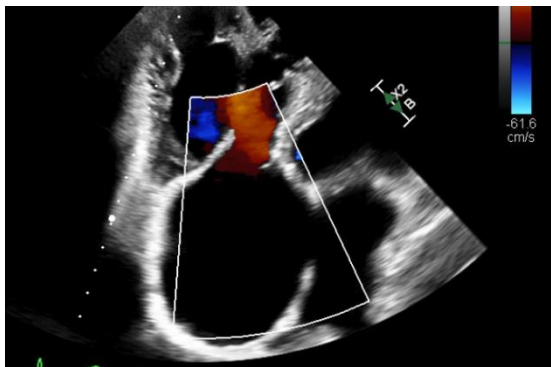
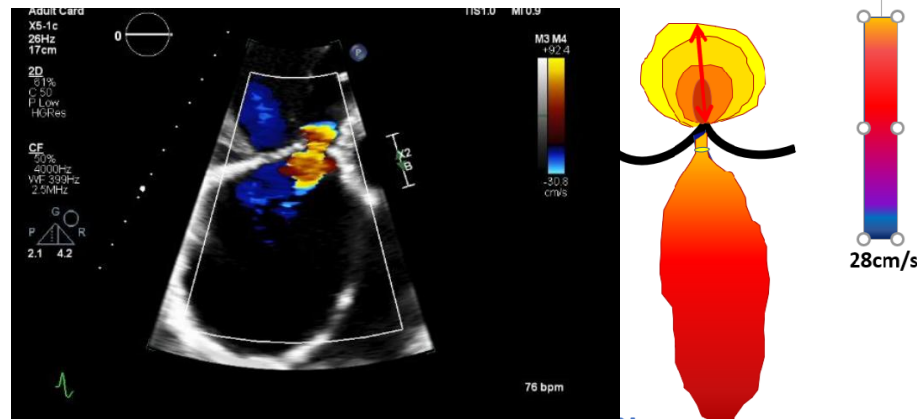
Qualitative

Semi-quantitative

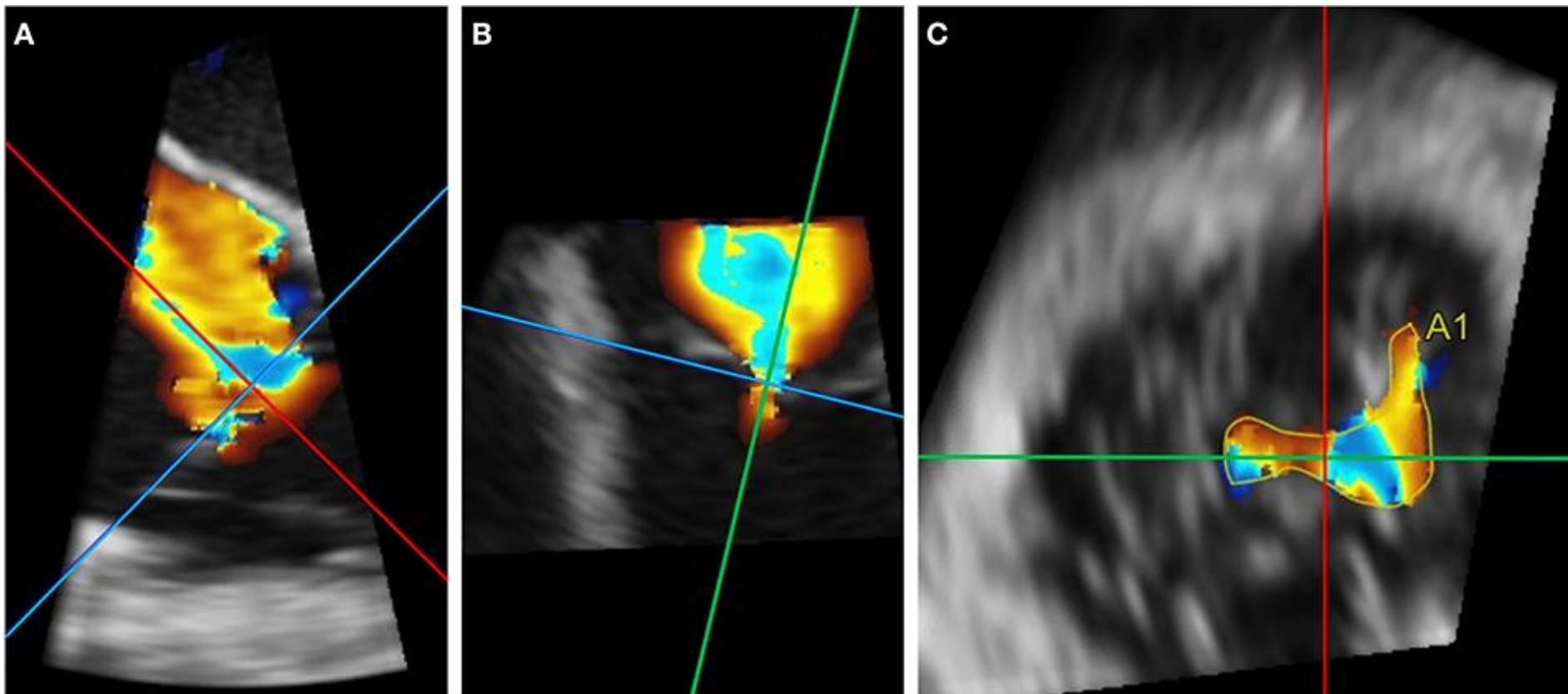
- PISA radius ≥ 9 mm (at Nyquist 20–30 cm/s)

Quantitative

- EROA $\geq 40 \text{ mm}^2$
- RVol $\geq 45 \text{ mL/beat}$
- RF $\geq 50\%$
- 3D VCA $\geq 75 \text{ mm}^2$



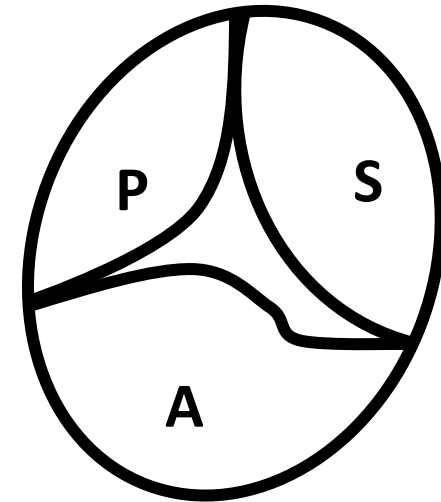
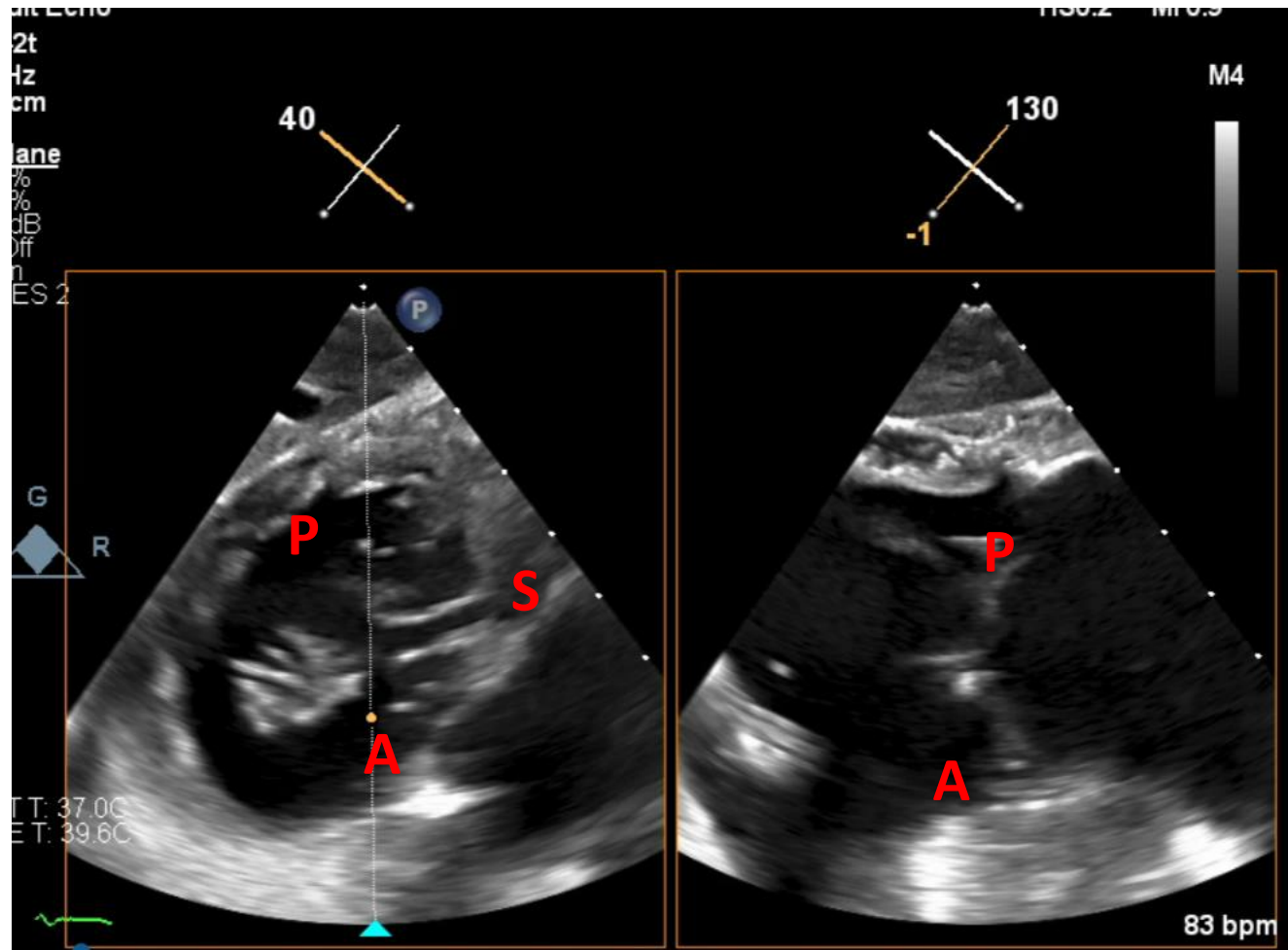
3D vena contracta area



Těžká regurgitace VCA $\geq 0,75\text{cm}^2$

Winkel et al., Front. Cardiovasc. Med., 2020

Echokardiografie anatomie TEE



Echokardiografické a invazivní zhodnocení funkce PK a PH

Cardiovascular changes

RV dilatation^a

RV basal diameter index:
>24 mm/m²

RV mid-diameter index:
>21 mm/m²

Tricuspid annulus index:
>21 mm/m²

RV end-diastolic
volume index:
>95 mL/m²

RV end-systolic
volume index:
>37 mL/m²

RV dysfunction^a

RV dysfunction:

TAPSE <17 mm
RV TDI s' <10 cm/s
RV FWS <23%
RV GLS <21%
3D RV EF <50%
FAC ≤35%

Severe RV dysfunction:

TAPSE <10 mm
RV TDI s' <6 cm/s
RV FWS <11%
RV GLS <9%
3D RV EF <35%
FAC ≤22%

Pulmonary pressures

Pre-capillary PH:

mPAP >20 mmHg
PAWP ≤15 mmHg
PVR >2 WU

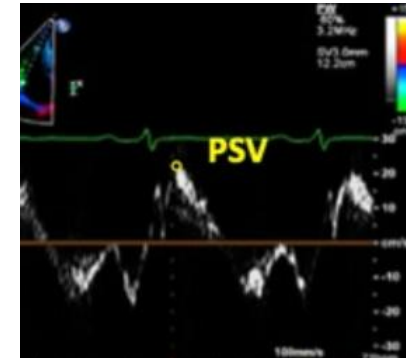
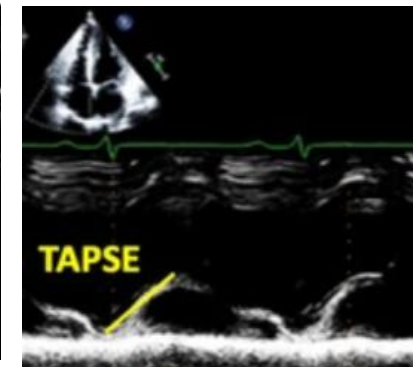
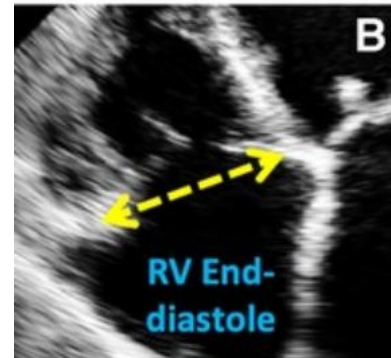
Post-capillary PH:

mPAP >20 mmHg
PAWP >15 mmHg
PVR ≤2 WU

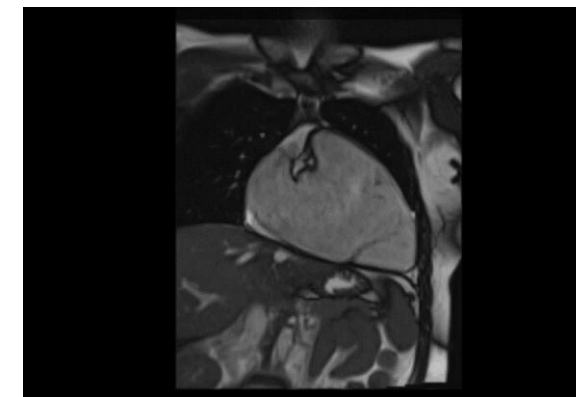
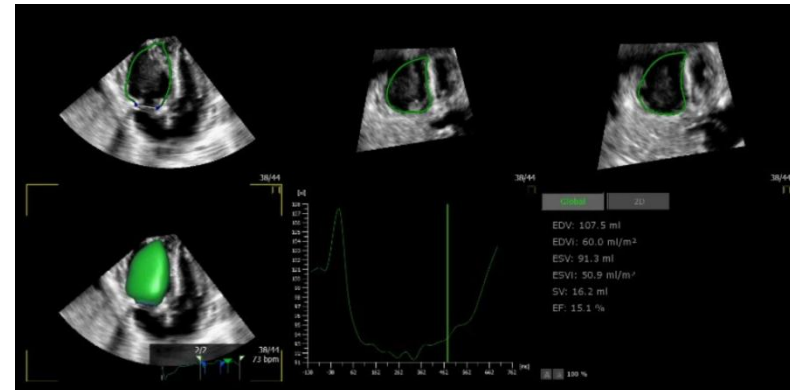
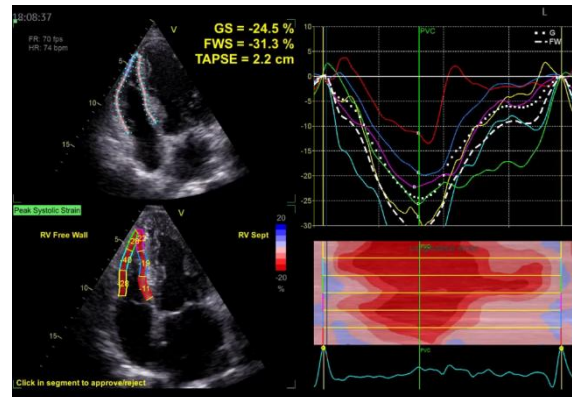
Severe PH:

PVR >5 WU
mPAP >35 mmHg

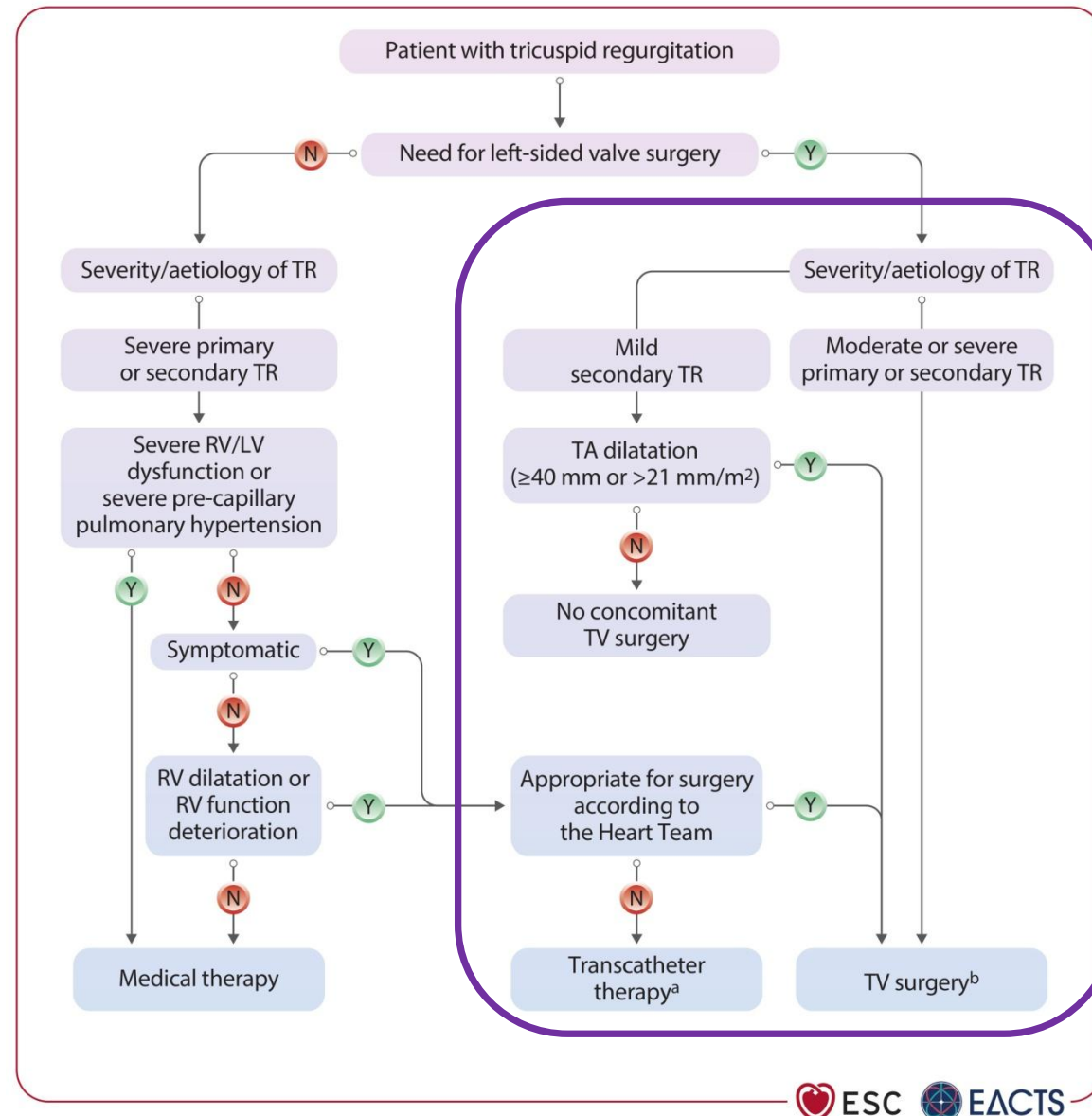
standardní echo



pokročilé echo a event. MRI , PSK



Management léčby pacientů s TR



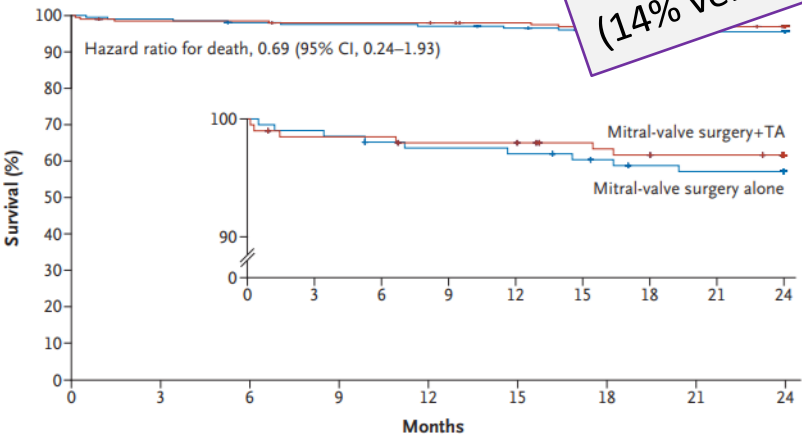
Pacienti s TR a onemocněním chlopní levého srdce podstupující KCH výkon

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Concomitant Tricuspid Repair in Patients with Degenerative Mitral Regurgitation

J.S. Gammie, M.W.A. Chu, V. Falk, J.R. Overbey, A.J. Moskowitz, M.J. Mack, P. Voisine, M. Krane, B. Yerokun, M.E. Bowdish, L. Conra, M.A. Miller, W.C. Taddei-Peters, N.O. Jeffries, M.K. Parides, R. Weis, E.A. Rose, J.C. Mullen, S. Raymond, E.G. Moquete, K. O'Sullivan, M. A. Iribarne, F. Beyersdorf, M.A. Borger, A. Geirsson, E. Bagiella, J. A.C. Gelijns, P.T. O'Gara, and G. Ailawadi, for the CTSN Investigators



No. at Risk	0	3	6	9	12	15	18	21	24
Mitral-valve surgery+TA	198	194	194	192	192	189	187	186	184
Mitral-valve surgery alone	203	201	198	197	196	194	191	190	190

Incidence primární endpointu byla rozdílná, v případě že TR byla středně významná. Pokud byla méně než středně významná, nebyl zaznamenán statistický rozdíl

TVP vedla k nutnosti častější implantace pacemakeru (14% versus 2,5%)

with tricuspid repair in the
from a Cardiothoracic
trial

Samantha Raymond, MPH^c · ...
Marc Gillinov, MD^t for the trial investigators^{*} · ... Show more

Article Info

Predictors of Pacemaker Implantation in the Setting of Mitral Valve Surgery

CTSN Clinical Trail	Methods and Predictors	Implications												
In a recent RCT of patients with degenerative MR and moderate or less TR, tricuspid annuloplasty during mitral valve surgery was highly successful in mitigating risks of TR but was associated with a higher risk of PPM implantation. 401 Patients in RCT Excluded 2 with baseline PPM 29 PPM implantation within 30 days 36 PPM implantation within 2 years	- Time-to-event models for PPM implantation with death and heart failure related implantation as competing risks - In all patients, tricuspid annuloplasty most strongly predicted PPM placement within 2 years: HR 5.94 (95% CI, 2.27 – 15.53) - In all patients at 2 years: <table><thead><tr><th></th><th>HR (95% CI)</th><th>P Value</th></tr></thead><tbody><tr><td>Age (5 years)</td><td>1.23 (1.01 – 1.52)</td><td>.04</td></tr><tr><td>Tricuspid annuloplasty</td><td>5.94 (2.27 – 15.53)</td><td>< .001</td></tr><tr><td>LVEF</td><td>0.96 (0.92 – 0.99)</td><td>.02</td></tr></tbody></table>		HR (95% CI)	P Value	Age (5 years)	1.23 (1.01 – 1.52)	.04	Tricuspid annuloplasty	5.94 (2.27 – 15.53)	< .001	LVEF	0.96 (0.92 – 0.99)	.02	- The benefit of mitigating late progression of TR must be weighed against the risks of PPM implantation. - Tricuspid annuloplasty and age are risk factors for PPM implantation, and higher baseline LVEF reduces PPM risk in patients who undergo mitral valve surgery for degenerative MR.
	HR (95% CI)	P Value												
Age (5 years)	1.23 (1.01 – 1.52)	.04												
Tricuspid annuloplasty	5.94 (2.27 – 15.53)	< .001												
LVEF	0.96 (0.92 – 0.99)	.02												

Faktory ovlivňující výkon na trikuspidální chlopni

Factors favouring concomitant TV surgery	Factors not favouring concomitant TV surgery
TR moderate or more	TR mild
Tricuspid annular dilatation	No tricuspid annular dilatation
Chronic AF	First-degree atrioventricular block, pre-existing left bundle branch block
Significant RA dilatation	Normal RA dimension
RV dilatation or (non-severe) dysfunction	Normal RV function and diameter
Presence of (non-severe) TV leaflet tethering	Absence of TV leaflet tethering
Pulmonary hypertension SPAP ≥ 50 mmHg	Normal pulmonary pressures
Reversible renal and liver dysfunction	No other comorbidities

Risk factors	Scoring
Age ≥ 70 years	1
NYHA functional class III–IV	1
Right-sided HF signs	2
Daily dose of furosemide ≥ 125 mg	2
Glomerular filtration rate < 30 mL/min	2
Elevated total bilirubin	
LVEF $< 60\%$	
Moderate/severe RV dysfunction	
Predicted in-hospital mortality according to risk score	
Score:	Predicted in-hospital mortality:
0	1%
1	2%
	3%
	5%
4	8%
5	14%
6	22%
7	34%
8	48%
≥ 9	65%

Triscore

Doporučení pro výkony na trikuspidální chlopni

Revize

Patients with tricuspid regurgitation and left-sided valvular heart disease requiring surgery

Concomitant TV surgery is recommended in patients with severe primary or secondary TR.

I

B

Concomitant TV repair should be considered in patients with moderate primary or secondary TR, to avoid progression of TR and RV remodelling.

IIa

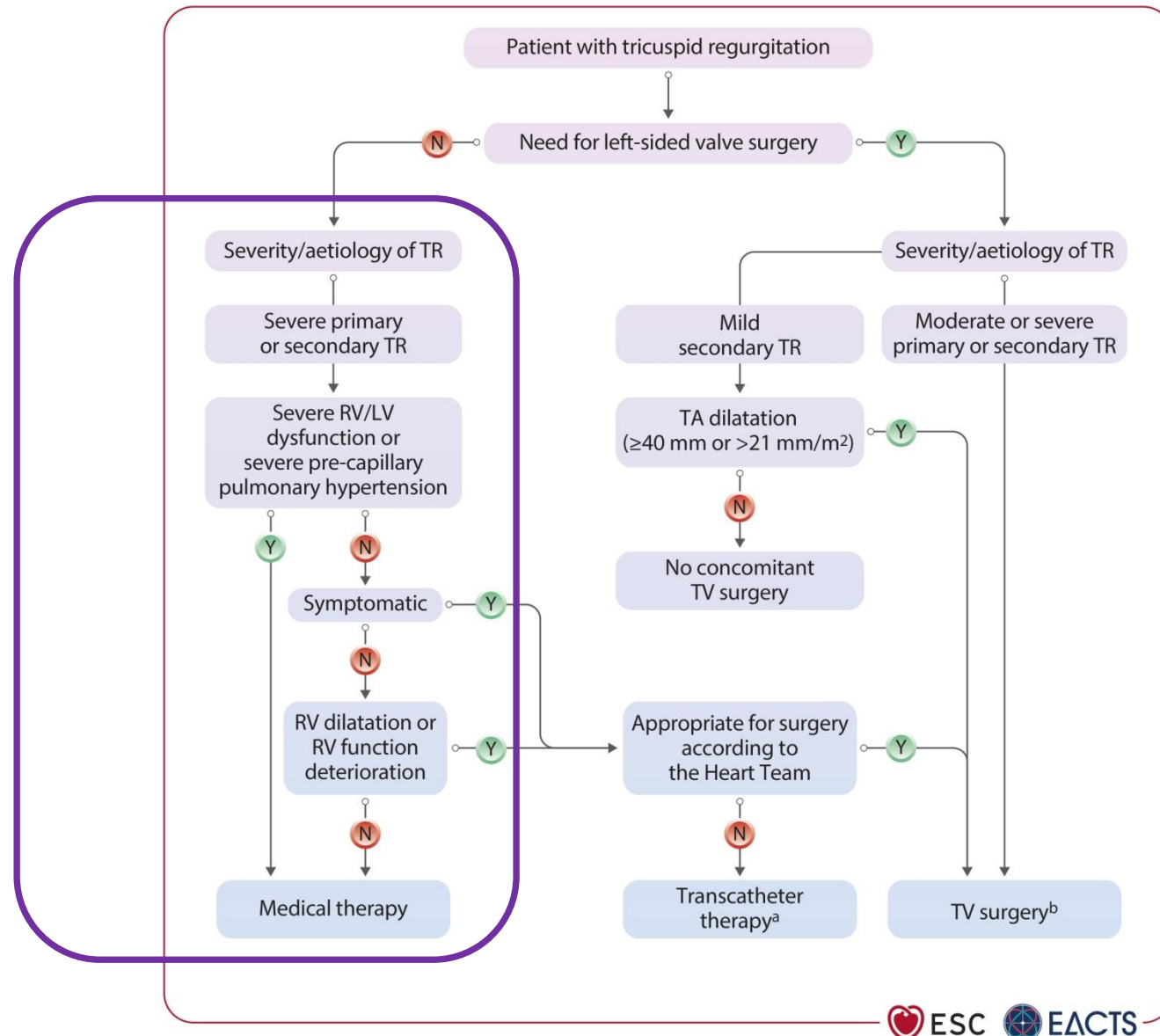
B

Concomitant TV repair may be considered in selected patients with mild secondary TR and tricuspid annulus dilatation (≥ 40 mm or > 21 mm/m²), to avoid progression of TR and RV remodelling.

IIb

B

Management léčby pacientů s TR



Doporučení pro chirurgické výkony na trikuspidální chlopni

Recommendations	Class	Level
Patients with severe tricuspid regurgitation without left-sided valvular heart disease requiring surgery		
TV surgery is recommended in symptomatic patients with severe primary TR without severe RV dysfunction or severe PH.	I	C
TV surgery should be considered in <u>asymptomatic patients with severe primary TR who have RV dilatation/RV function deterioration, but without severe LV/RV dysfunction or severe PH.</u>	IIa	C
TV surgery should be considered in <u>patients with severe secondary TR who are symptomatic or have RV dilatation/RV function deterioration, but without severe LV/RV dysfunction or PH.</u>	IIa	B

Katetrizační výkony na trikuspidální chlopni

ORIGINAL ARTICLE

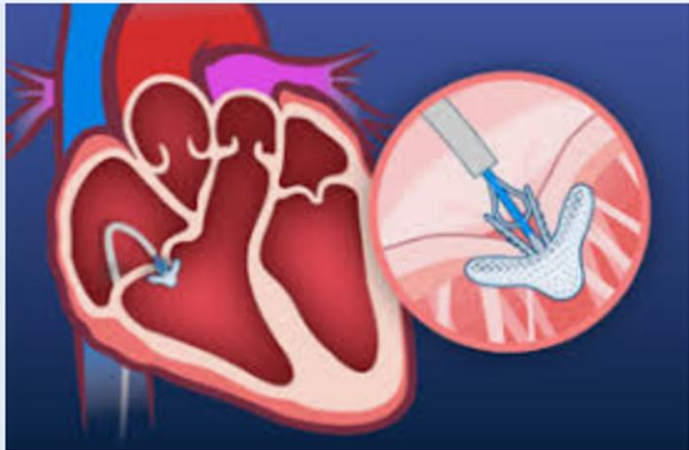


Transcatheter Repair for Patients with Tricuspid Regurgitation

Authors: Paul Sorajja, M.D., Brian Whisenant, M.D., Nadira Hamid, M.D., Hursh Naik, M.D., Raj Makkar, M.D., Peter Tadros, M.D., Matthew J. Price, M.D., ⁺¹⁹, for the TRILUMINATE Pivotal Investigators* [Author Info & Affiliations](#)

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Transcatheter Repair for Patients with Tricuspid Regurgi...

ORIGINAL ARTICLE

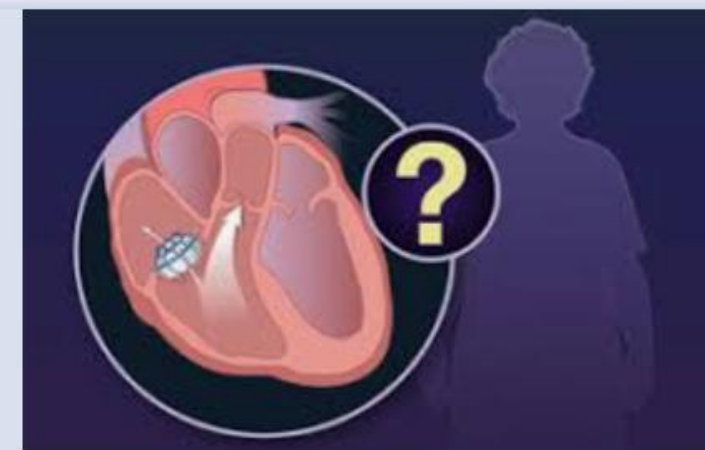


Transcatheter Valve Replacement in Severe Tricuspid Regurgitation

Authors: Rebecca T. Hahn, M.D., Raj Makkar, M.D., Vinod H. Thourani, M.D., Moody Makar, M.D., Rahul P. Sharma, M.D., Christiane Haeffele, M.D., ⁺¹⁹, Charles J. Davidson, M.D., ⁺²⁷, for the TRISCEND II Trial Investigators* [Author Info & Affiliations](#)

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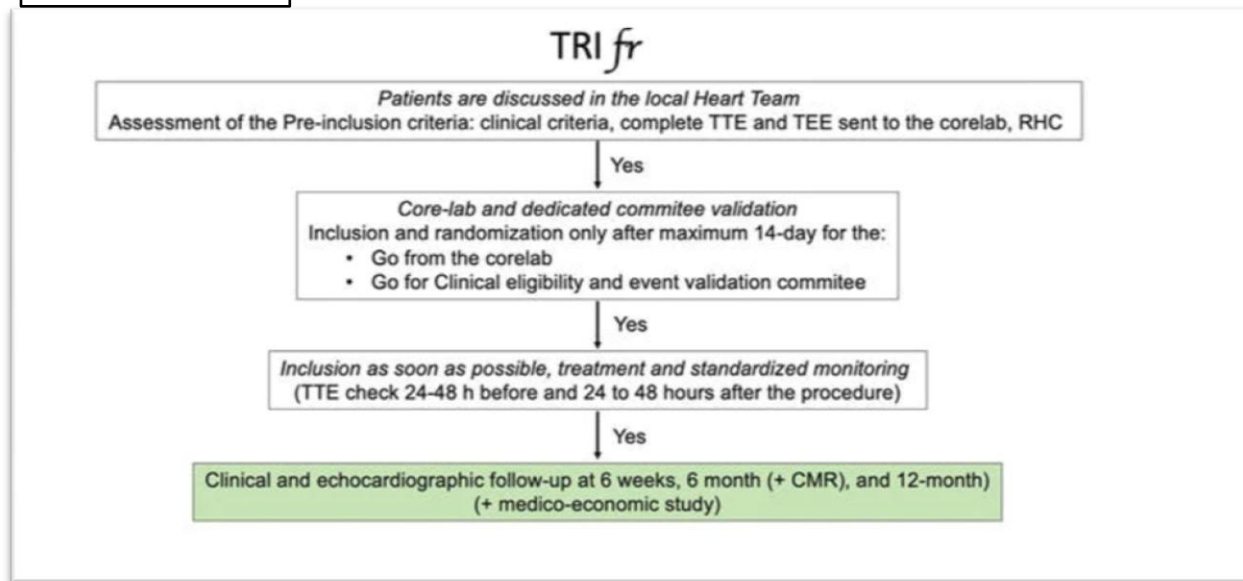


New England Journal of Medicine

Transcatheter Valve Replacement in Severe Tricuspid ...

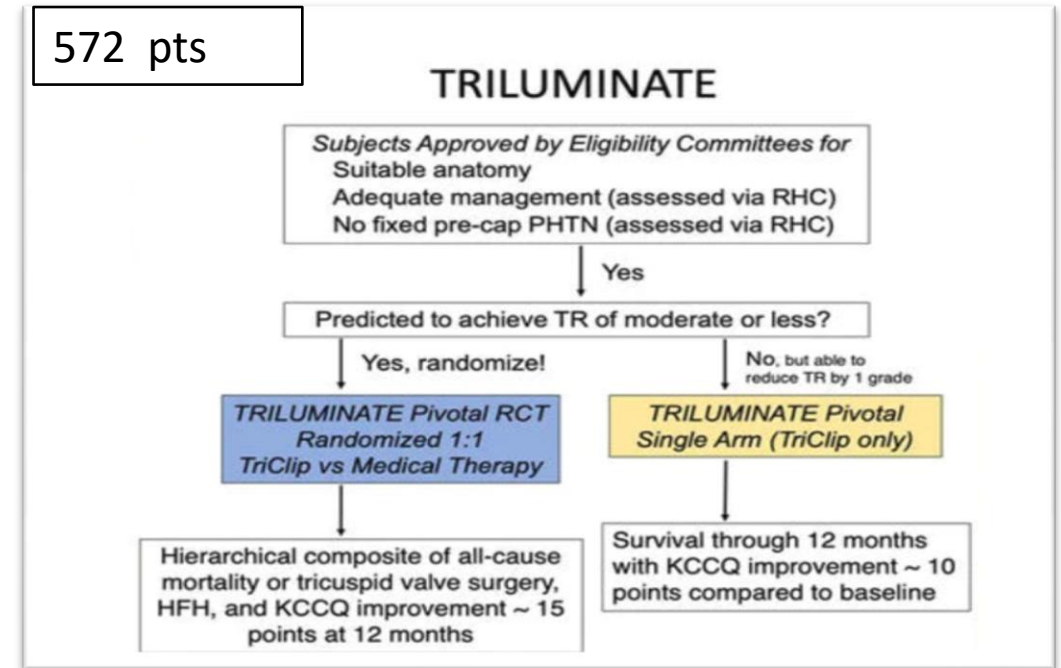
Katetrizační výkony na trikuspidální chlopni

300 pts



Donal E et al., JAMA 2024

572 pts



Kar S et al., Circulation 2025

Transcatheter TV treatment should be considered to improve quality of life and RV remodelling in high-risk patients with symptomatic severe TR despite optimal medical therapy in the absence of severe RV dysfunction or pre-capillary PH.

Ila

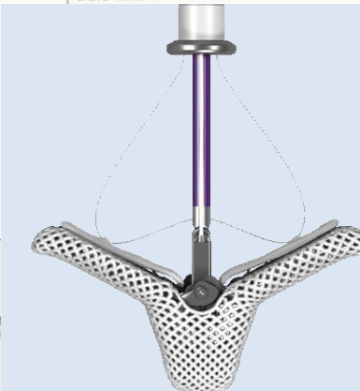
A

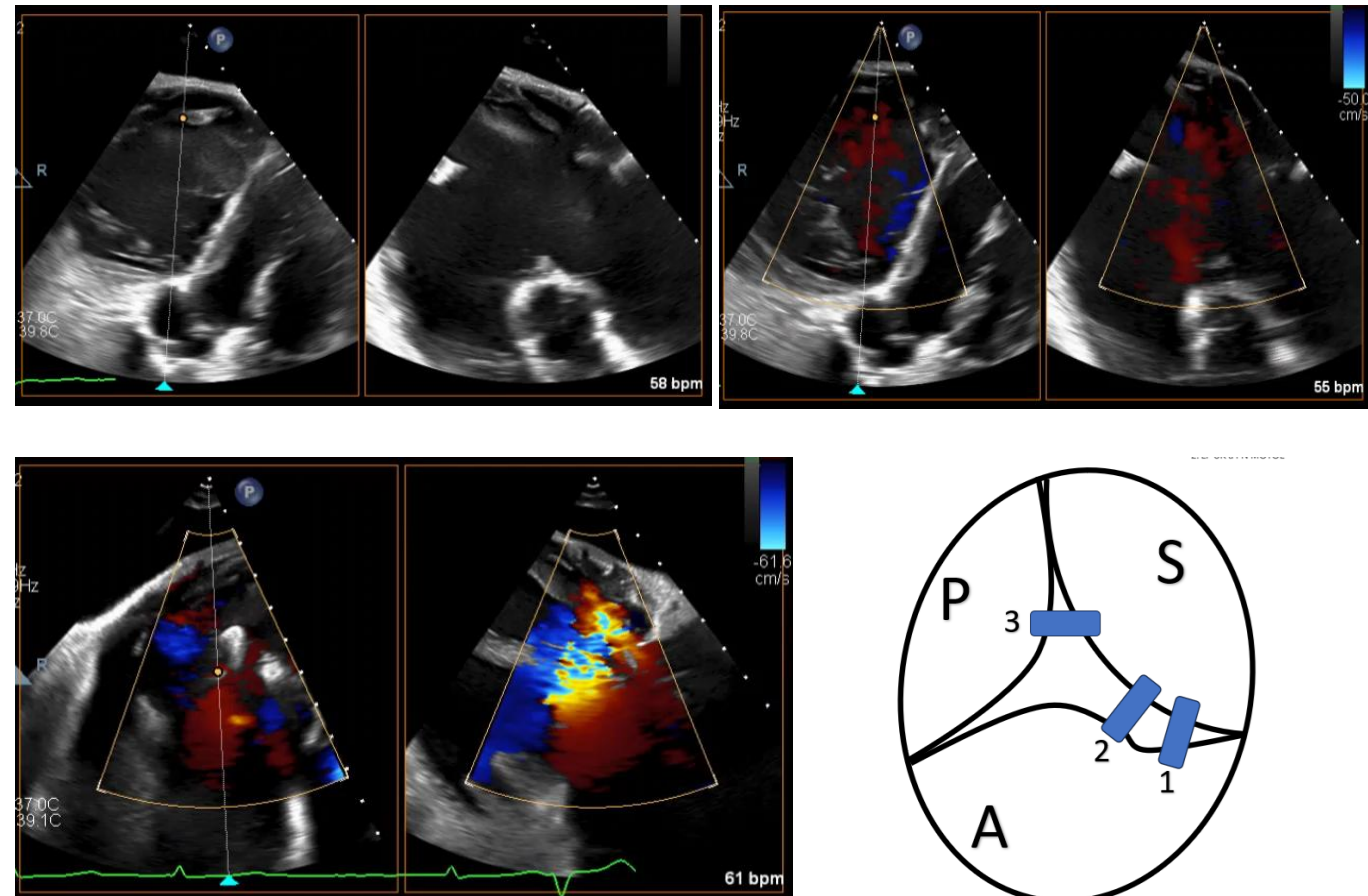
Revize

Transkatérová léčba TR

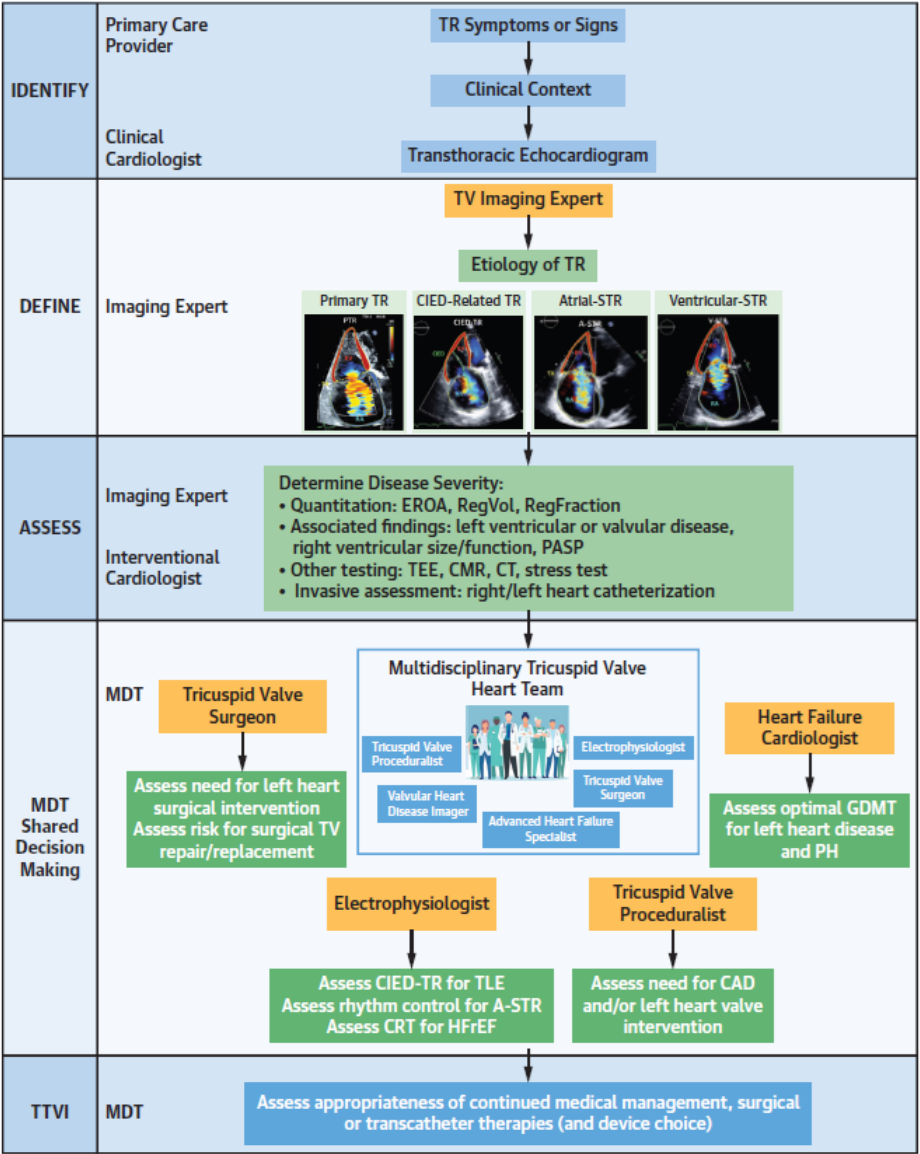
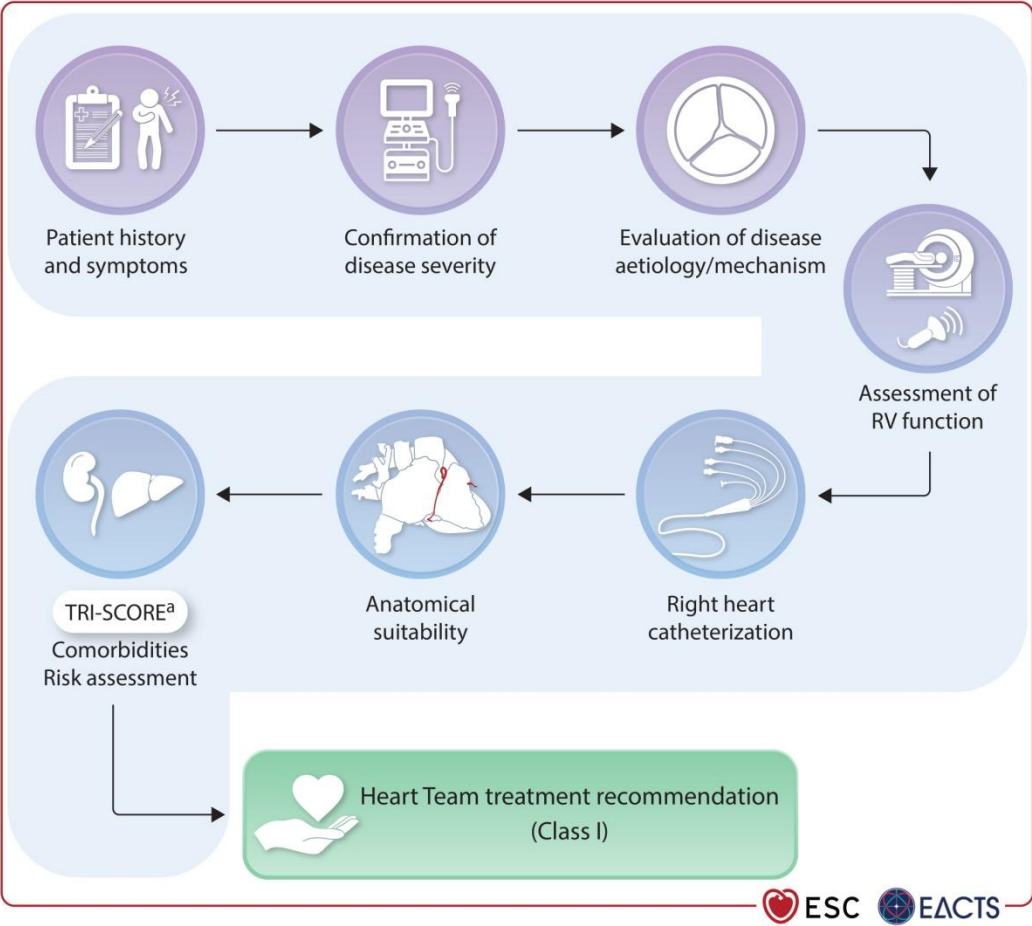
Transcatheter TR treatment: anatomical suitability

Table 3. Anatomical criteria for device selection.

Strategy	Favourable anatomy	Feasible anatomy	Unfavourable anatomy
Leaflet approximation	Small septolateral gap ≤ 7 mm¹⁰ Anteroseptal jet location Confined prolapse or flail Trileaflet morphology	Septolateral coaptation gap >7 but ≤ 8.5 mm⁶⁵ 	Large septolateral coaptation gap >8.5 mm⁶⁵ Leaflet thickening/shortening (rheumatic, carcinoid)/perforation Chordae with marked leaflet tethering Anteroposterior jet location Pre-existing echocardiographic leaflet malcoaptation Pre-existing RV lead leaflet impingement Unfavourable device angle of approach
Annuloplasty	Annular dilatation as primary mechanism of TR Mild tethering (tethering height <0.76 cm, tenting area <1.63 cm², tenting volume [3D] <2.3 mL)¹¹ Central jet location Sufficient landing zone for anchor	Excessive annular dilatation (exceeding device size) Severe tethering (tethering height >0.76 cm, tenting volume >3.5 mL), or echocardiographic annular malcoaptation^{110,111} Proximity of RCA Pre-existing RV lead leaflet impingement	Excessive annular dilatation (exceeding device size) Unfavourable device angle of approach Severe right ventricular dysfunction
Orthotopic valve implantation	Previous surgical repair or bioprosthetic valve replacement Leaflet thickening/shortening (rheumatic, carcinoid) Incidental CIED RV lead (i.e., without leaflet impingement) Any leaflet morphology	Large coaptation gap CIED RV lead leaflet impingement	Excessive annular dilatation (exceeding device size) Unfavourable device angle of approach Severe right ventricular dysfunction



Závěr



Děkuji za pozornost

